INTERNATIONAL HELLENIC UNIVERSITY

School of Economics & Business Administration

MSc in Sustainable Development

Name: Lazaros Rizopoulos

Student ID: 1105120009

Intake: September 2012

Subject: Dissertation

Title of Work: *Review of Environmental Management Systems in international military sector. Pilot study and recommendations for the Hellenic Armed Forces.*

Course Leader:

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I confirm that the work I have submitted is: (Tick one category only)

My own unaided work √ The unaided work of my project group

With help (give details)……..

Date: 30/1/2014

Marker's Comment:

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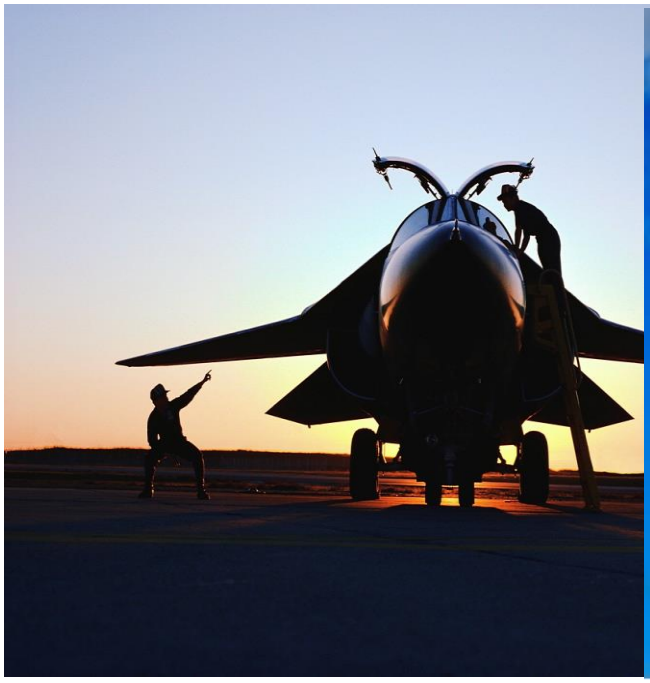
INTERNATIONAL HELLENIC UNIVERSITY

MSc in «Sustainable Development»

Review of Environmental Management Systems in international military sector. Pilot study and recommendations for the Hellenic Armed Forces.



Lazaros Rizopoulos

Dissertation

Dr. Constantinos Euaggelinos

Thessaloniki, 2014

Abstract

The effective and sustainable environmental performance of a business is a result of various factors and most important the integrated outcome of the Environmental management. Likewise, the integration of environmental management into the Armed Forces' activities has also gain interest for the military sector internationally. Therefore, the Environmental Management System (EMS) is recognized as one of the most widely used tools.

The EMS provides an organization with a system framework to identify, control and monitor its activities and processes which can directly or indirectly have environmental impacts. A fully-implemented EMS encompasses organizational structure, responsibilities, procedures, plans, resources, and policy. Most researchers and growing environmental public movement, nowadays, are focused on EMS' implementation, while they evaluate the improvement of environmental performance, with the relevant[1] available structures in order to determine the most effective mean for EMS planning, evaluation and review process.

Although, there are not enough study results and evidence of its application in the military sector, there are worldwide, countries or international bodies - like United States, Australia and NATO - that have an EMS structure in place to assist military environmental management, as well as studies which reveal that the Army could anticipate positive outcomes from EMS.

However, it is still controversial if the positive outcomes or the economic benefits were due to the EMS implementation. Moreover, a relevant environmental management framework still has not been constantly implemented during the military procedures and activities. Although EMS has been generally accepted as substantial positive factor by the majority of studies, the multitasking characteristics of Defence sector's activities result in the need for the eco-friendly related issues to be directed in a holistic and integrated way[2], with the help of a certified EMS.

[1] Environmental Performance Indicator (EPI)

[2] Diecidue, T., (2008), Military-to-military collaboration on environmental management: A framework for strategic information, education and communication. Project Performance Corporation, Virginia, USA

The first part of this study will provide a review on environmental management issues related to the military activities, as also as their assessment and standardization procedures in international military sector. A case-by-case approach will be examined in order to outline evidence to the evaluation of the environmental management frameworks. Based on the results of the literature review, appropriate recommendations will be presented, which may contribute to the EMS considerations as the most important tool for effective management framework and most importantly to evaluate its effectiveness as a structure for the complex Defence sector's activities.

In the second part, the study will provide a pilot project to develop, implement and study potential costs and benefits of undertaking an EMS in a selected Greek military unit.

The study will provide a general overview, while trying to identify legislation gaps and provide recommendations regarding the environmental management structures among Greek Armed Forces. It will provide useful insights for implementing relevant tools during Hellenic military activities; assess the correlation between the existence of an EMS and environmental effectiveness and finally attempt to articulate operational guidelines for the Hellenic Armed Forces.

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1. Introduction

It is generally accepted that in recent years, there is a growing concern regarding the environmental management, resulting in a growing added value internationally, while relevant frameworks and tools appear.[3] The public concern for environmental management in a holistic way has constantly gained power due to various domains, such as increasingly complex and uncertain environmental situations, introduction of relevant legislation, growing environmental movement and request for more effective management of the non-renewable resources and reduced burden.[4]

Environmental management has complex characteristics and includes variety of domains, such as operations, technologies, products, services, strategies and management tools.[5] It is considered to be a framework for effectively managing the activities of an organization in order to secure their performance in a responsible manner concerning the environment. Additionally, it can be used as a structure for management of resources in a cost-effective way and reduced environmental burden. Nowadays, EMS among other tools like EIA (environmental impact assessment), CBA (cost-benefit analysis) and LCA (life-cycle assessment) ensures public environmental performance information while helping the organization's boards to be eco-friendly.[6]

Thus, the Environmental Management System is recognized worldwide to be one of the most effective[7], and till today, the International Organization for Standardization (ISO) 14001 remains the only global standard providing guidelines for an EMS implementation.[8]

Accordingly, the ISO model is the only standard that may help the Defence sector and Armed Forces internationally to establish their own EMS,

[3] Kolk, A. and A. Mauser, (2002), The evolution of environmental management: From stage models to performance evaluation. Bus. Strategy Environ., 11: 14-31. http://onlinelibrary.wiley.com/doi/10.1002/bse.316/pdf

[4] Rao, N.H., (2005), Environmental management: Relevance and implications for management of defence installations for sustainability. Curr. Sci., 88: 1753-1758. http://eurekamag.com/research/012/043/

[5] Wang X.H. and W. Wu, (2013) "A review of Environmental management Systems in global defence sectors", American Journal of Environmental Sciences

[6] ibid

[7] ibid

[8] NHDES, (2002), Research into the effectiveness of environmental management systems. US Environmental Protection Agency, Region I, New England. http://des.nh.gov/organization/commissioner/pip/publications/co/documents/nhdes-01-3.pdf

adapted to their sole characteristics. In addition, the implementation of ISO 14001 is now growing fast in the public sector and the military sector, as well.

An EMS is a holistic approach which allows for environmental considerations to be integrated and incorporated into the everyday life and decisions of an Organization. It establishes the proper framework of an environmental program and provides the directions for the planning, doing, checking, monitoring, evaluation, communication and updating of the environmental program. It assists an organization to control the impact of its activities, conform to current legal requirements, but as well as to identify and act proactively, thus, manage future sources that might have a negative impact. It is mainly based on four stages – Plan, Do, Check, Act, which is as well known as PDCA cycle.

The environmental management of the Armed Forces' activities looks to be a growing concern for military forces and Defence sector worldwide[9], so this study will try to review the implementation levels of EMS' as well as to evaluate its effectiveness in the military activities.

Military sector and the Armed Forces are an essential and sensitive part of any nation with multitasking and complex characteristics and their equipment, infrastructure and actions are constantly correlated with the environment. The military authorities all over the world recognize nowadays that the effective environmental management is a key factor in order to ensure operations in the long run.[10]

Military activities may take place in sensitive ecosystems, so their environmental management has gained concern and has been recently a complicated research topic[11]. Armed Forces' actions may have great impacts on the environment where they occur while military camps and training areas are placed near sensitive regions concerning the environmental characteristics.[12] Additionally, the growing public concern about military actions and their

[9] Ramos, T.B. and J.J. Melo, (2006), Developing and implementing an environmental performance index for the Portuguese military. Bus. Strategy Environ., 15: 71-86. http://onlinelibrary.wiley.com/doi/10.1002/bse.440/pdf

[10] Wang X.H. and W. Wu, (2013) "A review of Environmental management Systems in global defence sectors", American Journal of Environmental Sciences

[11] ibid

[12] Rao, N.H., (2005), Environmental management: Relevance and implications for management of defence installations for sustainability. Curr. Sci., 88: 1753-1758. http://eurekamag.com/research/012/043/

environmental burden is a reality of our days. Thus, the challenges of environmental management in the military sector are growing and the integrated management of its activities should be a priority while it is also crucial to study the effectiveness of the EMS as a framework among them. Many studies provide evidence that implementation of environmental management systems into the military sector and its activities may have great outcomes and it is more that needed.[13]

The EMS standards and guidelines secure continual environmental improvement of the military sector, ensuring that the environmental challenges in the future will be met. However, implementing an EMS demands the top level management loyalty and relevant policies to be adopted. The needed procedures and the proper steps should be written and documented and more than desirable is the fact that training sessions for each level should be scheduled in order to ensure that everyone is capable and qualified to act effectively in the terms of the policy adopted.

It is crucial to examine holistically the environmental burden of Defence activities, because such an examination will provide the needed information in order to form the baseline for the proper policies and finally the most appropriate measures. However, a usual mistake is to consider that measures are part of the environmental management system. As noted by many researchers, this is misunderstood and many authority officials consider that taking protection measures is always a basic part of the EMS[14]. Taking the appropriate measures in an integrative model has to be a consequence and the result of the effective implementation of an EMS. The management system usually unveils their necessity early enough, so that the particular actions can be decided by the military authorities proactively and not since after the impacts result in inappropriate outside coercions. In addition, strategic planning and effective control-mechanisms is required. And this is exactly the main advantage and the essence of every environmental management system.

Nowadays, several nations are running studies in order to integrate an EMS into their Defence sector, and the majority of them use the ISO14001 or

[13] NATO-CCMS, (2000). Pilot study on environmental management systems in the military sector. http://www.nato.int/science/publication/publi/envmil/envmil2.pdf

[14] www.nato.int

other similar EMS frameworks for their baseline structures. Several examples are reviewed in different studies. Unlike, in Greece, it was only in 2007 that the Ministry of Defence (MoD) announced its Environmental Policy and in 2010 a memorandum of cooperation was signed between MoD and the Ministry of Environment, Energy and Climate Change (MoEECC).

1.1 Background

It is generally accepted that in recent years, there is a growing concern regarding the environmental management, resulting in a growing added value internationally, while relevant frameworks and tools appear.[15] The public concern for environmental management in a holistic way has constantly gained power due to various domains, such as increasingly complex and uncertain environmental situations, introduction of relevant legislation, growing environmental movement and request for more effective management of the non-renewable resources and reduced burden[16].

In the 1980s, the United Nations Environment Programme (UNEP) described environmental management as the control of human activities that have potential impacts on the environment. So, EMS as a tool assists in performing in a more environmentally responsible manner. It can also help to be more cost effective and take advantage if the resources in the most effective manner.

This dissertation focuses on the environmental management of military activities using the tool of EMS. From the literature review, it is clear that there are few studies of the EMS results and performance during military activities. More research is, therefore, needed. Sustainable environmental management is a social responsibility, and Defense is not exempt[17]. So, the integration of EMS frameworks into military actions should be a priority goal[18].

[15] Kolk, A. and A. Mauser, (2002), The evolution of environmental management: From stage models to performance evaluation. Bus. Strategy Environ., 11: 14-31.
http://onlinelibrary.wiley.com/doi/10.1002/bse.316/pdf
[16] ibid
[17] Ramos, T.B. and J.J. Melo, (2005), Environmental management practices in the defence sector: Assessment of the Portuguese military's environmental profile. J. Cleaner Product., 13: 1117-1130.
http://www.deepdyve.com/lp/elsevier/environmental-management-practices-in-the-defence-sector-assessment-of-1tEs1BELCf
[18] Wang X.H. and W. Wu, (2013) "A review of Environmental management Systems in global defence sectors", American Journal of Environmental Sciences

This research has significance for contributing the conduct of environmentally responsible military training and the improvement of environmental management among Hellenic Armed Forces. Hopefully, it will produce systematic research results for day-to-day environmental management; this study may also help in the management of military sites in the future. The research, therefore, can support the Hellenic Ministry of Defense (MoD) to achieve its “Defense Environmental Vision”.

1.2 Research questions of the study

Research Questions

a. Evaluate the existence and operation of Environmental Strategic Plans and their effectiveness in Defense sector internationally. Are Environmental Performance Standards or Indicators used?

b. Evaluate the level of implementation EMS in Defense sector internationally.

c. Identify Knowledge gaps and provide recommendations for improving and highlighting aspects regarding EMS implementation and evaluation in the military sector.

d. Provide the international practice as a “pilot” to develop, implement and study potential costs and benefits of undertaking an EMS in the Armed Forces (GRC).

e. Evaluate the present level of Environmental Awareness among the Greek key authority officials and military personnel. Identify the existing Sustainability Initiatives and provide recommendations.

f. Provide recommendations for improving DoD activities and routine environmental management.

1.3 Outline

Chapter 2 provides a literature review in the following areas: applications of an EMS; methods of an EMS’s evaluation; and developments of environmental management systems in Defense sector. It describes the policy,

planning and implementation stages respectively both in international and national level.

Chapter 3 provides the methodology adopted by this thesis, like interviews, questionnaires, personal audits and data-processing techniques. Therefore, this chapter describes the methodology used to obtain data in this research project in order to achieve the aims. It starts by addressing the rationale of the methodology, follows by the questionnaire design, the sampling criteria, the telephone and personal interview design

Chapter 4 presents the outcomes of the research. It describes the implementation structures of EMS in the military sector. Additionally, examines the level of environmental awareness among Hellenic MoD personnel.

Chapters 5 and 6 contain a discussion and the conclusions of this study. The findings are summarized, and research methodology discussed. Finally, recommendations for the implementation of an EMS in Defence sector are provided, and possible further research suggested. Finally in the chapter 6 the limitations of the study are highlighted.

Annex A provides guidelines in order to be easier for the military sector to address and implement an EMS while Annex B introduces the selected study area as an example. This Annex analyses how the sustainable initiatives operate, and how they contribute in developing effectively a management system and proactively comply with relevant legislation and regulations. The features of this project are also described.

2. Literature Review

2.1 History of the EMS

In the recent years, environmental issues have increasingly gained governments', organizations' and citizens' as well awareness, resulting in the increased concern to address and manage environment systematically. Therefore, the idea and similar to EMS frameworks emerged[19]. The report "*Limits to Growth*", released in 1972 by the Club of Rome, presented that the earth's resources cannot any more support the most of the developed world

[19] Coglianese C, Nash J., Regulating from the Inside: Can Environmental Management Systems Achieve Policy Goals? Washington DC, p.31-61

way of life[20]. The following years, environmental movement and other interest or pressure groups, managed to point out the environmental issues and put them on the agenda of the politicians and since then, relevant policies have evolved.

It was obvious then that business should react and respond to peoples' demands. In the beginning the industrial response concerned only technical, "end-of-pipe" proposals presented as solutions, like by putting filters on the top of the chimneys. Of course, over the years though, such solutions proved to be inadequate, because they only hided the causes and not provided solutions to the problem. Just then, the governments were prompted to enact legislation that led to the clean-up policies and procedures of land and water management. But still, the problems were not confronted in an integrated manner.

So, the afore-mentioned methods need to be replaced by more holistic solutions which cover the operations, from cradle to grave. The practice showed that environmental problems often resulted from lack of organization and proper processes including human errors as well as lack or poor communication and inadequate information. Fortunately, in the 1980s, both business and governments presented systematic approaches to environmental problems such as the EMS which considered being the milestone[21].

2.1.1 Evolution of the EMS

Mostly in developed world and gradually in the rest of the world, the approach on the issues concerning the environment has shifted substantially. In the beginning, the concentrated efforts were focused on legislative and regulatory structures and the business response was typical reactive, just to comply with the regulations[22].

Only after the Stockholm Conference on the Human Environment in 1972 and the World Conservation Strategy of the International Union for the Conservation of Nature in 1980, the global leaders realized that there was an urgent need to form an international body in order to raise the sustainable development awareness[23]. Brundtland Commission[24] was formed in 1984 and

[20] http://www.clubofrome.org/?p=326
[21] www.nato.int
[22] Sheldon C., Yoxon M., (2006), Environmental Management Systems: A Step-by-Step Guide to Implementation and Maintenance, 3rd ed, Earth Scan, London, Ch. 1
[23] http://www.planningforsustainability.co.uk

its mission was to unite countries to pursue sustainable development. In 1987, its report[25] was published and the term of "sustainable development" was presented. At the same report the industry was prompted to develop and implement effective environmental management systems.[26] A great number of global leaders acknowledged the report's value. Just then, the UN Conference on Environment and Development (UNCED) was held in Rio de Janeiro, June 1992. The result, also known as "Agenda 21"[27], was considered to be a world consensus and commitment at the highest political level[28]. Figure 1 shows an overview of environmental development and Figure 2 the cradle-to-grave approach.

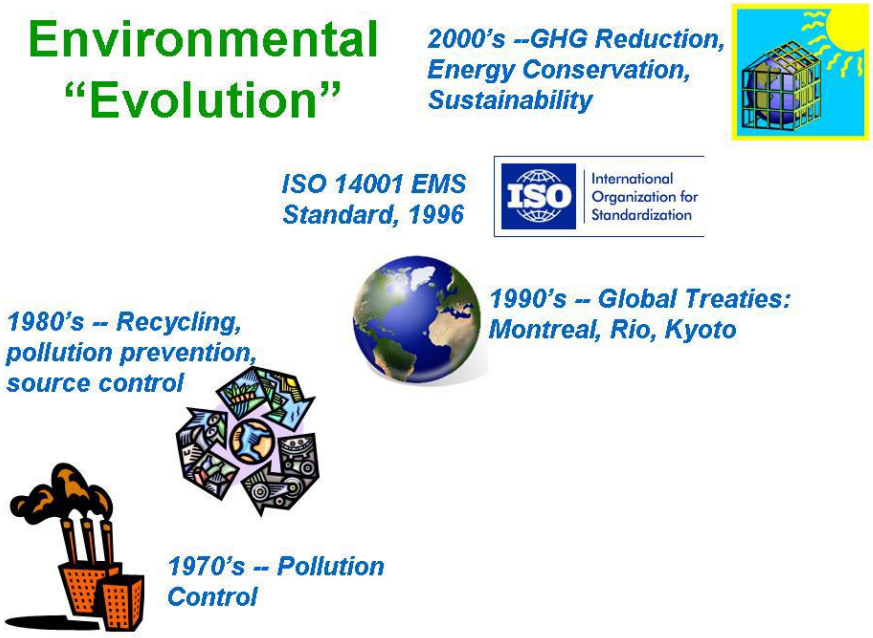

Figure 1 - the Environmental Evolution
(Source: CSCA)

[24] Formally known as the World Commission on Environment and Development (WCED)
[25] "Our Common Future"
[26] http://en.wikipedia.org/wiki/Brundtland_Commission
[27] http://en.wikipedia.org/wiki/Agenda_21
[28] www.nato.int

Figure 2-Cradle -to- Grave Solutions
(Source: LEFTMN)

2.2 EMS standards development

Standard methodologies were sought by the industry while the EMS systems were started to develop. The British Standards Institute created the BS 7750 in March 1992. BS 7750 was the first standard to be developed while others like EMAS (Eco-Management and Audit Scheme) for the European Union and the ISO 14001 (International Organization for Standardization) followed. The latter is remaining the only internationally accepted and is necessary if is to be applied in global international trade terms. Other similar standards were also created in other countries. Figures 3 to 5 presents the relevant logos.

- **BS 7750 - (British Standard 7750)**

In March 1992, the BS 7750 were presented initially by British Standard Institute concerning the environmental management, and in 1994 the second updated edition was published. BS 7750 was a specification for an EMS rather than a guidance document. Guidelines and details are provided regarding the

implementations steps and how the relevant environmental policies and measures comply with the existing legislation[29].

Figure 3 - BS Logo
(Source: British Standards Institution - BSI)

- **EMAS - (European Union Eco-Management and Auditing Scheme)**

The EMAS – (Eco-Management and Auditing Scheme) was published by U in April 1995. EMAS is considered to be a voluntary framework and can be addressed among the EU member states. The evaluation of participants' environmental performance and commitment to continual improvement as well as publicly available information is a crucial requirement of EMAS[30].

Figure 4 -EMAS Logo
(Source: European Commission)

- **ISO**

However ISO Organization is a non-governmental organization of about 100 national standards bodies which was established in 1947, only after 1990 working groups have been developed standards for environmental issues and

[29] http://www.quality.co.uk/bs7750.htm
[30] http://ec.europa.eu/environment/emas/

domain. In 1995, the ISO 14001 framework was emerged and in 1996 was finally published[31].

Figure 5 - ISO 14001
(Source: ISO Organization)

2.3 EMS in the military and private sectors[32]

In 1996, a survey on EMS implementation over 400 companies[33], showed that only 15% of the 64% of those which claimed having an EMS conformed to all the EMS aspects. This was an improvement compared to the 2.5% in 1994. Likewise, since 1996, there were an increased number of companies that have developed an EMS. Studies[34] showed that many benefits exist in implementing an EMS, because it is a crucial strategic issue and a core process; affects the operation chain and reduce the risks; influence stakeholders' perspectives and drives the quality of the products and the stability of the processes.

Concerning the Defence sector's environmental footprint, this is usually substantially bigger than others sectors. Taking into account the equipment which is used by the Armed Forces, it the next step forward to implement an EMS. It seems to be the most effective method in order to secure the environment and operational capabilities. In addition, the majority of the nations' Armed Forces use the same or familiar tasks and infrastructure, so the demands as well the challenges are more or less related.

[31] http://www.iso.org/iso/home/standards/management-standards/iso14000.htm
[32] NATO-CCMS, (2000). Pilot study on environmental management systems in the military sector. http://www.nato.int/science/publication/publi/envmil/envmil2.pdf
[33] KPMG's Canadian Environmental Risk Management Practice
[34] ibid

Under these considerations, there was a need for NATO Alliance to start study under NATO's Committee on the Challenges of Modern Society (NATO/CCMS) in order to define common policies and frameworks in adopting an EMS[35]. After examining the baseline data the Pilot Study concluded that EMS implementation can produce benefits for military actions and reduce costs. Therefore, NATO produced guidelines to assist the member states in planning and implementing an EMS[36].

The Pilot Study considered the most commonly used aforementioned frameworks (BS 7750, ISO 14000 and EMAS), and the Canadian CSA Z750. It was obvious though that all the standards might be similarly adopted due to minor differences between them. However, the ISO 14000 standard was recommended, mainly because of the following reasons:

- it is the most current and recognized worldwide,
- it may easily be supplemented to the ISO 9000
- it has already used by member states of Alliance,
- it is probably the most attainable standard and last but not least, is user-friendly.

2.4 Environment and EMS in international Defence sector

The aforementioned NATO Alliance's guidelines were intended to help Defence sector implementation of an EMS. The appropriate steps were described and each stage was also illustrated with examples. It does not, though, just only represent the standards. Instead, it takes a unique perspective for bodies and governments organizations which are primarily concerned with other rather than environmental issues[37].

In the beginning, the military authorities should take into account both Defence and environment demands and the way these to interact. This relationship will strongly influence the view while developing an EMS, thus affecting the successful implementation of it. The primary role of military sector is the military Defence; thus the primary consideration is to serve and protect

[35] initiated in 1996
[36] http://www.denix.osd.mil/international/upload/Environmental-Guidelines-for-the-Military-Sector2.pdf
[37] www.nato.int

the security and global peace. Therefore, other priorities like environmental will always hold less important attention. Moreover, the military activities are unavoidably multitasking and while the primary consideration of them is security and defence, the military organizations are continual increasingly have to comply with regulatory boundaries in order to protect and preserve the environmental resources.

Moreover, the Defence sector should act in a more sustainable ways for the following:

- Sustainable approaches will ensure the long run of the military activities.
- Eco-friendly approaches will improve the image of the Armed Forces to the public and enhance their bounds.
- Reduced costs will be the outcome of the effective resources management.

The aforementioned approaches and management should be considered as a tool. The key authorities' officials should try to address these concepts to the personnel before and not only after adopting an EMS. Decision-making process of everyday operations can include integrated methods into all levels. So, it should be considered as chance to reduce costs and gain benefits and finally save money.

But to shift the perspectives, military sector should be able to watch tangible savings. Just then, effective practices will take place in everyday military life. The actions as well the commitment of top level members have a substantial role to play.

2.5 Other researches

Armed Forces' activities may have serious environmental impacts, including for instance of waste pollution, water pollution, soil erosion and many others which impact the ecosystem and / or the human health.[38] The activities

[38] Ramos, T.B. and J.J. Melo, (2005), Environmental management practices in the defence sector: Assessment of the Portuguese military's environmental profile. J. Cleaner Product., 13: 1117-1130. http://www.deepdyve.com/lp/elsevier/environmental-management-practices-in-the-defence-sector-assessment-of-1tEs1BELCf

and training actions conducted result in the considerably variety and the intense of the impacts

A number of researches have been conducted regarding the Defence sector's correlation with the environmental ecosystem and its impacts, which have used several techniques and methods[39]. It is necessary for the military officials to take proactive action to understand in depth the environmental impacts of the military activities. So, the aforementioned studies have resulted in establishing several management frameworks, such as the ITAM – (Integrated Training Area Management) in the USA[40] and the CATT – (Combined Arms Tactical Trainer) and ILMP – (Integrated Land Management Plan) in the UK[41].

2.6 Application of EMS systems by Defence sector in different countries

2.6.1 General

NATO, as noted before, set the example during the 1990s and tried with a pilot study to integrate environmental management into military activities, proposing the ISO14001 EMS framework. The implementation of this tool in military activities was recommended by the CCMS of NATO Alliance which emphasized its advantages. The relevant pilot study reported as well summarized guidelines[42] and concluded that EMS integration in Armed Forces would have better results and be more effective if the ISO14001 framework was implemented. After the release of this study, several workshops were held to find ways of filling the gaps between EMS theory and practice in Defence sector.[43] The NATO guidelines concerning the environmental management

[39] Wang X.H. and W. Wu, (2013) "A review of Environmental management Systems in global defence sectors", American Journal of Environmental Sciences
[40] U.S. Army Sustainable Range Program (SRP)
[41] Wang X.H. and W. Wu, (2013) "A review of Environmental management Systems in global defence sectors", American Journal of Environmental Sciences and
British Army, *"Transforming the British Army",* An Update - July 2013
http://www.army.mod.uk/documents/general/Army2020_Report.pdf
[42] NATO-CCMS, (2000). Pilot study on environmental management systems in the military sector.
http://www.nato.int/science/publication/publi/envmil/envmil2.pdf
[43] Wang X.H. and W. Wu, (2013) "A review of Environmental management Systems in global defence sectors", American Journal of Environmental Sciences

were also supported by the NATO STANAG (Standardization Agreement) publication for Environmental Protection.

EMS, like mentioned above, is based on the proven model which is the well-known PDCA cycle and the ISO 14001 standard is the model which may help the Armed Forces to address their own EMS, adapted to their singular characteristics.

In various researches where the Defence sector of different countries' adoption of an EMS are reviewed, EMS seems to be a crucial tool in securing the maximum performance while trying to be a pioneer in environmental management.

2.6.2 Brief History

- **U.S. Army Forces & EMS**

Various environmental policies, directives, army regulations, and systems has instituted since the 1970s by the U.S. Army to ensure its compliance with national policy and the fact that its actions have the minor impacts and effects on the environment[44]. The U.S. Department of Defense (DoD) was the first to establish a formal structure in order to implement an EMS in 1970. *"The U.S. Army Environmental Strategy into the Twenty-First Century"*[45] presents the guidance for achieving the aforementioned objectives. Specific actions plans, goals and objectives were consisted of this strategy[46]. It has four environmental areas which are *compliance, restoration, prevention, and conservation* and each area has relevant objectives.

The Strategy summarizes an action plan to develop a long-term sustainability run in order to achieve and maintain operations capability; mission requirements; impacts mitigation and reduced costs among while providing incentives for innovative actions and the increase of the Soldiers well-being.

In October of 2004, *"The Army Strategy for the Environment: Sustain the Mission—Secure the Future"* was published (Figure 6). The strategy presents the long-term vision, founded on sustainability that demands from the Army to

[44] http://www.aepi.army.mil/ and http://www.ntis.gov/search/product.aspx?ABBR=ADA572073
[45] hosta.atsc.eustis.army.mil
[46] U.S. Army, (2004), *"The Army Strategy for the Environment: Sustain the Mission – Secure the Future"*

accomplish its mission in the long run. Likewise, Figure 7 shows the connection among the mission, the community, the environment and the U.S. Army[47].

In December of 2005, *"The Environmental Management System – Implementers Guide"* was published, which purpose was to provide personnel with a comfort, easy to follow tool for implementing the Armed Forces' EMS[48]. In March of 2007, *"The Commander's Guide for Mission-Focused Environmental Management System"*[49] was published to give the primary directions to Commanders.

Therefore, since the last 30 years, the U.S. Army has started its efforts to sustainability and finally included EMS systems through the Department of Defence program, anticipating that way the Executive Order 13148[50].

Concluding, it can be referred that the U.S. Army had since the beginning, the major components for an ISO 14001 standard. The relevant Armed Forces regulations which provide the guidelines and the general structure in accordance with ISO 14001 can be categorized as following: Army regulations (AR), plans and strategies and management processes, reports, and databases. However, additional documentation will be needed to meet the exact ISO requirements.

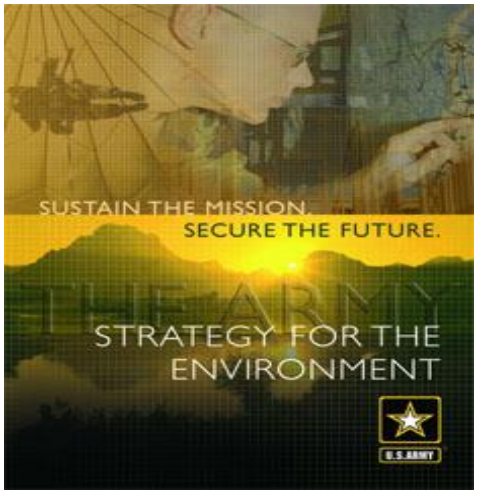

Figure 6 - the U.S. Army Strategy for the Environment
(Source: U.S. Army Maneuver Center of Excellence-2014)

[47] U.S. Army Environmental Center, (2004), *"Environmental Management Systems – Aspect and Impact Methodology for Army Training Ranges"*
[48] U.S. Army Environmental Center, (2005),*" U.S. Army Environmental Management System – Implementers Guide"*
[49] www.sustainability.army.mil
[50] EO 13148, (2000), Greening the Government Through Leadership in Environmental Management, April 22, 2000

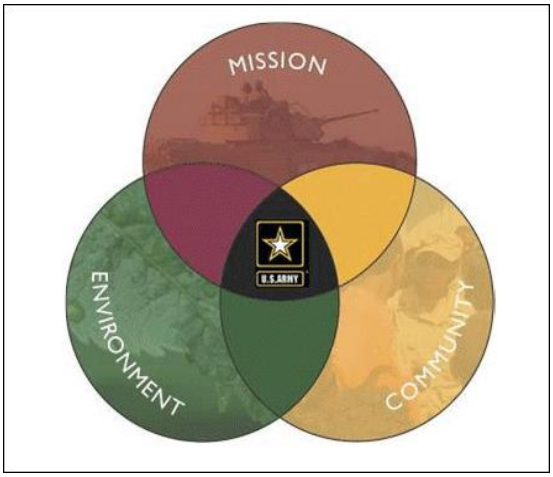

Figure 7 - Interaction among Environmental, Mission and Community
(Source: The US Army Strategy for the Environment-2014)

- ## NATO & EMS

Several NATO members DoDs have implemented EMS accordingly to other ministerial organizations and in a similar way to the rest public sectors' bodies. The Aforementioned Pilot Study conducted by the NATO CCMS, concluded that environmental impact of the military activities usually are greater than other's public sector's departments[51]. Therefore, the Study recommended that an EMS should be implemented and concluded that protecting the environment and maintaining operational readiness is both possible and desirable. Environmental policy for military operations in the NATO is characterized by a set of principles which promote environmental stewardship and protection and can be described as follows:

- the protection of environmental is everyone responsibility,
- legal compliance and conformity with international agreements,
- environmental planning added value acceptance,
- mitigating environmental damage in an opportune time[52].

In August of 2011, *"The AJEPP-3 – Allied Joint Environmental Protection Publication - Environmental Management System in NATO Operations"*

[51] NATO-CCMS, (2000), "*Pilot study on environmental management systems in the military sector",* Final Report
[52] NATO, (2008), *"Environmental Aspects of Military Compounds",* Phase II. NATO / SPS Short Term Project

(STANAG 2582) was published[53], in order for the Environmental Protection officers to be provided with an adequate level of understanding the Alliance process and procedures and best they will be able to integrate an EMS into. At the same date, *"The AJEPP-2 – Allied Joint Environmental Protection Publication – Best Environmental Protection Practices for Military Compounds in NATO Operations"*[54] was published as a best practice handbook for the Headquarters (HQ) as also for the operational and theatre level staff[55].

- **Canadian Army Forces & EMS**

The Canadian Land Force (CLF) established the "*Army Environmental Strategy"* and the "*Army Environmental Policy*", recognizing the importance of taking into account the environmental aspects in all decision making processes. In 1992, the Canadian Army approved the initial "*Land Force Command Environmental Action Plan"* and revised it in 1995. In 1997, the "*Leader's Guide to the Environment"* was also published[56]. The Canadian Army environmental policy shows that the continual improvement is a fundamental aspect to be considered in an EMS process. In 1995, in order to minimize the impacts on the environment caused by their activities, government and federal departments and agencies were directed to initiate developing EMS. The Canadian Armed Forces as also as the Department of National Defense (DND/CF) were directed to comply also with this requirement[57].

A properly designed EMS would provide the proper framework for an effective management of the environment according to the directions, which stated also that it will enlarge the environmental agenda and documentation while enhance the communication of the environmental performance. Therefore, DND/CF initiated several plans to minimize their impacts and to provide better conditions for the well-being of the soldiers and their families.

The plans were included several actions like oil-catching drip pans for the vehicle fleet or assisting in emergency situations like flood victims. Generally,

[53] NATO,(2011), *"The AJEPP-3 – Allied Joint Environmental Protection Publication - Environmental Management System in NATO Operations",* (STANAG 2582- Standardization Agreement 2582)
[54] NATO, (2001), *"The AJEPP-2 – Allied Joint Environmental Protection Publication - Best Environmental Protection Practices for Military Compounds in NATO Operations",* (STANAG 2582 - Standardization Agreement 2582)
[55] ibid
[56] Canadian Land Force Command, *"Environmental Management System – Fact Sheet"*
[57] www.nato.int

the initial approach led to the integrated plan which provided the proactive actions and frameworks towards sustainability and ecosystem protection. It also includes the need to for the master plan to be reviewed and updated if needed every three years[58]. As a result, the Land Force Command presented in 1999, its first EMS framework based on the ISO 14000 standard and so far has been updated two times, in 2008 and 2011[59].

- **Australian Army Forces & EMS**

Regarding the practices and methods of environmental management, Australia's Armed Forces have also gained concern and become increasingly aware of. Like other countries, Australia has also adopted the ISO14001 standard in many governmental bodies. By the end of 2003, it was required by the Australian government that all agencies to have implemented a certified EMS. Accordingly, the ADF – (Australian Defence Force), acknowledged its environmental responsibilities, and in 2001 developed an integrated EMS based on the ISO14001standard, in order to comply with the national legislation and the governments' requirements. The goal was to establish the proper framework for integrating environmental performance into every day and routine operations and military activities. Likewise, the ADF adopted relevant guidelines and measures accordingly to the EMS in order to facilitate environmental management[60].

2.6.3 Analysis of the U.S. Army and NATO EMS

Generally, the level of commitment to comply with the regulations and the need to improve directs the specific requirements for environmental performance with the EMSs. Moreover, EMSs direct concentration on systems in order to achieve the objectives which have been set in the environmental policy.

Most of the existing systems are designed to be performed according to the same Plan-Do-Check-Act (PDCA) cycle (Figure 8).

[58] Privy Council Office and the Canadian Environmental Assessment Agency, (2004), *"Strategic Environmental Assessment – The Cabinet Directive on the Environment Assessment of Policy, Plans and program Proposals – Guideline for Implementing the Cabinet Directive"*

[59] Canadian Land Force Command, (2008), *"Environmental Management System"*

[60] Wang X.H. and W. Wu, (2013) "A review of Environmental management Systems in global defence sectors", American Journal of Environmental Sciences

Figure 8 - PDCA Cycle

Plan

Identify and analyze the problem

Do

Develop solutions and implement one.

Check

Evaluate the results. Measure solution's effectiveness and examine whether it could be improved in any way.

Act

Standardize the solution and implement it fully.

- **US Army EMS[61]**

The purposes of the *"American Army Environmental Strategy"* are[62]:

- Sustain and even strengthen contribution to joint operational capability,

[61] www.asaie.army.mil

[62] U.S. Army, (2004), *"The Army Strategy for the Environment: Sustain the Mission – Secure the Future"*

- To achieve the present and future training, testing, and mission objectives and requirements,

- Increased abilities to run installations, including growing interdependency,

- Minimized impacts and reduced costs,

- Improved human health and safety.

It has been adopted six goals[63] in order to preserve the Army's characteristic of endurance. The goals are referred as the building blocks of sustainability. The link between the objectives and the actions needed is covered with these goals which are directed by relevant government acts[64]. They involve policy, planning, programming, implementation, and time to deliver the targets which are included.

Goal 1: Foster a Sustainability Ethic[65]

That means to set an inside the Army ethic which outweighs the target of just to comply environmentally to sustainability.

Goal 2: Strengthen Army Operations[66]

Greater operational readiness capabilities by achieving reduced environmental burden.

Goal 3: Meet, Test, Training and Mission Requirements[67]

That means to achieve the desired training, testing and mission requirements during the present and the future requirements, while trying to use the water and land resources in sustainable way.

Goal 4: Minimize Impacts and Total Ownership Costs[68]

Reduced costs and minimized impacts by incorporating sustainability in every action, activity or facility.

[63] http://www.docstoc.com/docs/51976641/Sustain-the-Mission-Project-Resource-Costing-and-Cost-Benefit
[64] Performance and Results Act and the Chief Financial Officers Act
[65] www.aepi.army.mil
[66] ibid
[67] ibid
[68] ibid

Goal 5: Enhance Well-Being[69]

To improve the well-being of the soldiers' lives.

Goal 6: Drive Innovations[70]

Incentives to drive innovations and technology pioneer solutions in order to meet the present needs and secure future challenges[71].

Figure 9 presents a sustainability strategy map.

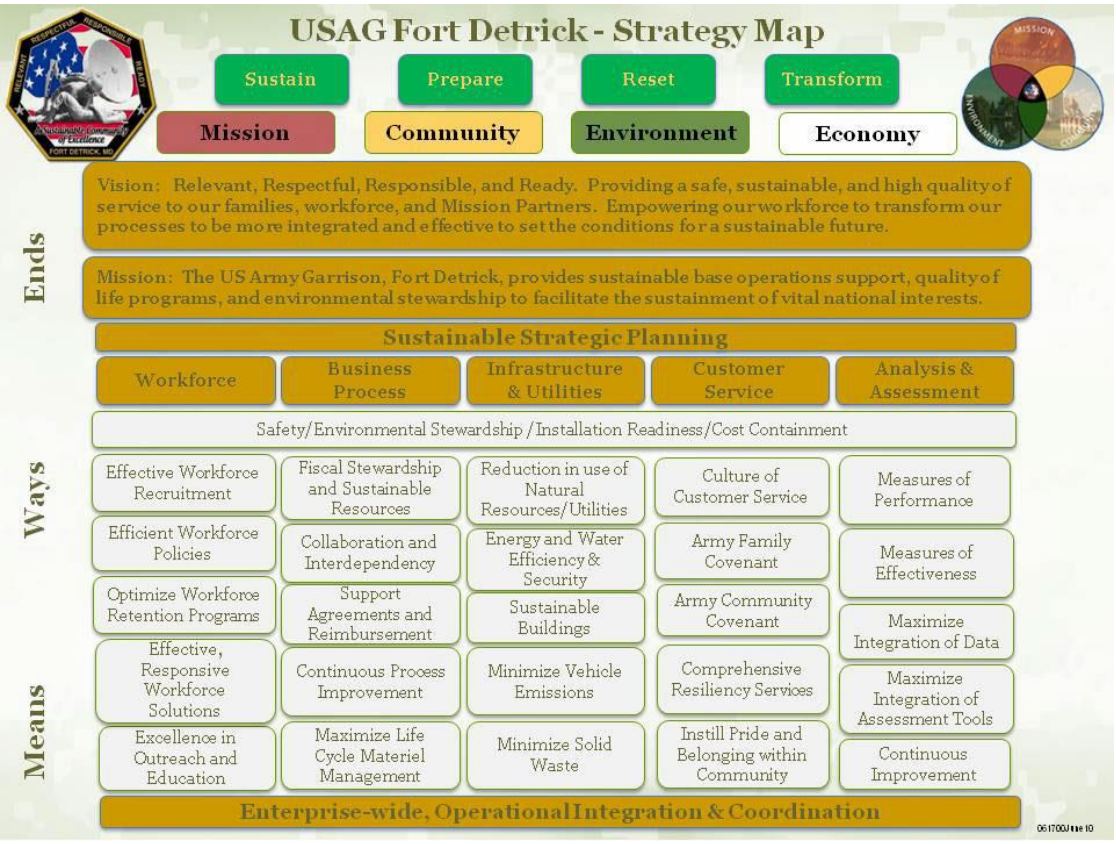

Figure 9 - FT Detrick Sustainability Strategy Map
(Source: The US Army FT Detrick Camp Strategic Plan - 2013)

The Army developed its management framework based on the ISO 14001 model due to the fact that the latter is the most commonly used and the only one globally recognized. The "*US Army Environmental Management System – Implementers Guide"* [72] describes 30 EMS implementation steps (see

[69] ibid
[70] ibid
[71] http://www.pica.army.mil/voice/voice2004/041217/041217%20Environment.htm
[72] U.S. Army Environmental Center, (2005),*" U.S. Army Environmental Management System – Implementers Guide"*

Figures 10 and 11). After the implementation of the basic elements of the EMS, the Army can focus on continual improvement, continuing to operate and examine the EMS and its methods, finding ways to make diagnostics in order to increase both effectiveness and ease of use.

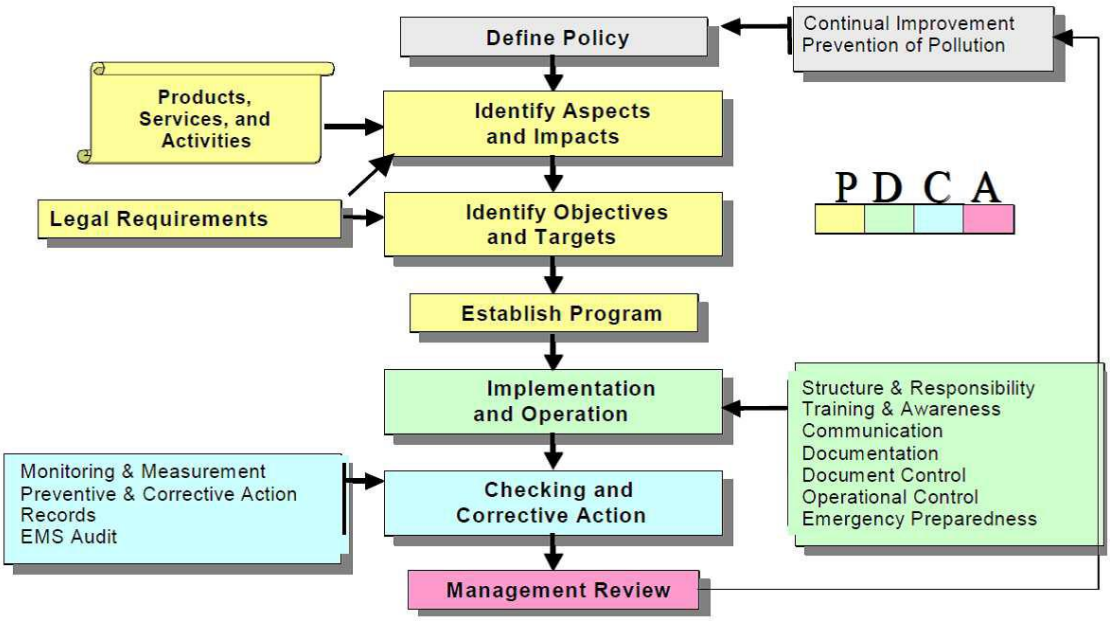

Figure 10 - PDCA Cycle of the US Army EMS
(Source: The US Army EMS)

Figure 11 - Continuous Improvement of the US Army EMS
(Source: The US Army EMS)

- **NATO**

The Environmental Policy (EP) for military operations includes a set of principles which often includes many of components as following: the ethic that everyone has the responsibility to protect the environment; regulatory compliance and respect of the relevant international agreements; included environmental planning in every planning process; the target to minimize the environmental impacts and damage at the least levels; setting environmental standards and measures to control the performance according to them; prioritize the waste management framework; ensure the effectiveness of the present handling and storage of hazardous substances and the response to environmental accidents or incidents as well as the report procedure of them in order to be secured from any hazard.

Therefore, the leaders or the Commanding Officers of the units should always be aware of the environmental policies and be able to set and define the proper requirements through documentation like the MoI - (Memorandum of Intent), SOP – (Standard Operating Procedures), or other Army Regulation Directives. The references should be included in the Operations Plan (OPLAN). Furthermore, the Environmental Officers need to be always aware of the mission objectives, be familiar with environmental protection standards, be the environmental planning leader and finally develop and implement the proper EMP – (Environmental Management Plan).

The key features and structure of the NATO EMS[73] are described in Figure 12.

[73] NATO, (2008), *"Environmental Aspects of Military Compounds",* Phase II. NATO / SPS Short Term Project

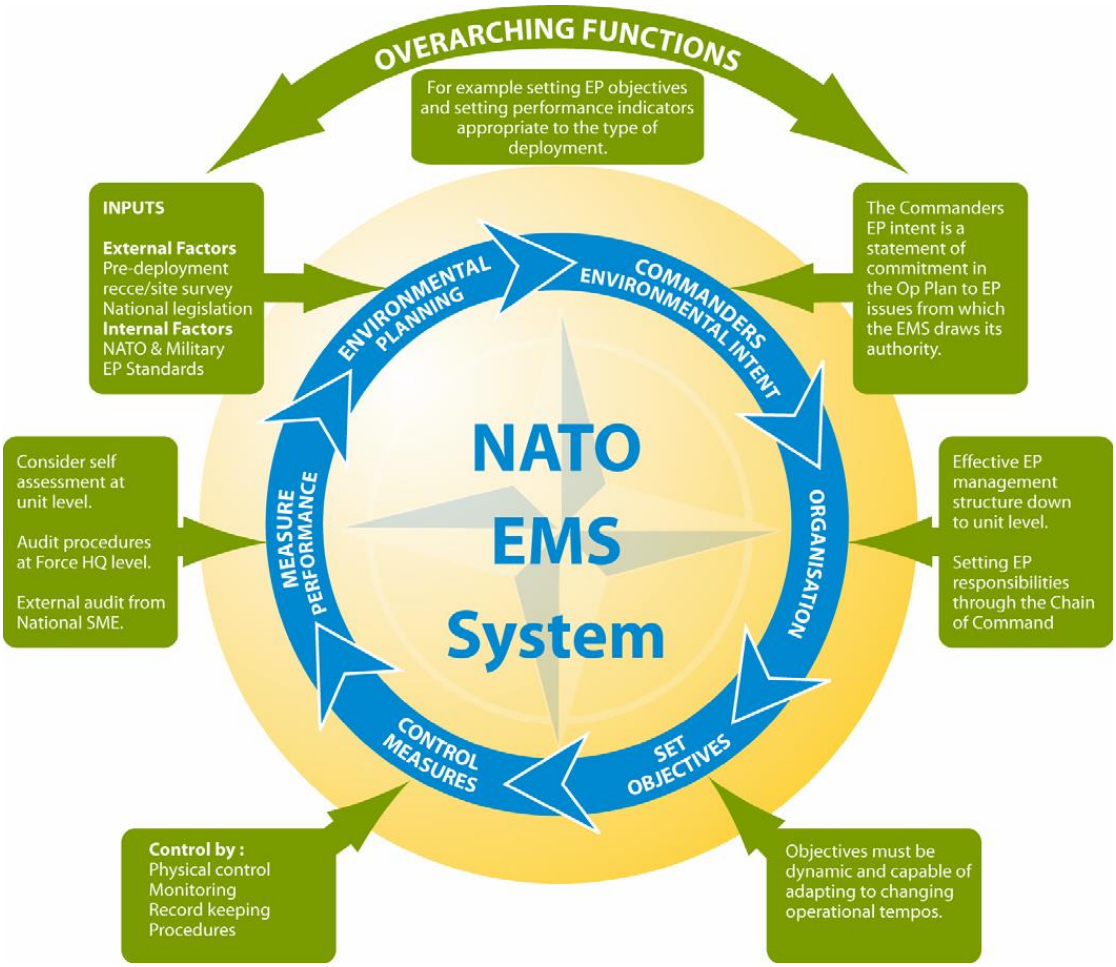

Figure 12 - NATO EMS Structure Planning
(source: www.nato.int)

2.7 Greek Armed Forces

In 2007, The Hellenic MoD published its first Environmental Policy[74], while trying to incorporate and comply with the relevant European legislation, as well as the NATO released doctrines and STANAGs. It was based in four basic principles:

- Compliance with Legislation
- Prevention and Proactive action
- Restoration
- Conservation

[74] available at http://www.mod.mil.gr/images/stories/perivalon/p-p.pdf (Greek version only)

Under those principles' structure, the primary objectives and main tasks of the 2007 Environmental Policy can be categorized as follows:

- Prevent and reduce environmental damage.
- Conduct waste management.
- Achieve energy efficiency.
- Reinforce recycling.
- Noise reduction.
- Collaboration with academic or research institutions.
- Maritime habitats protection.
- Recover from negative environmental effects.
- Training of Military Environmental Officers.
- Training of military personnel and take measures to increase environmental awareness.
- Protect EP installations and resources (including cultural property and biodiversity).

Therefore, in 2010 a Memorandum of Co-operation (MoC) was signed between the MoD and Ministry of Environment, Energy and Climate Change, covering the majority of the aforementioned areas[75] and as a result, the MoD planned and applied a series of initiatives as next:

- The "Green Armed Forces" webpage of the Hellenic MoD, which covers environmental protection and energy efficiency issues related to the activities of the Armed Forces. Currently the webpage is under development hence its content is limited. However, it is planned that, in the near future, it will be enriched with a variety of relevant information. The webpage is mainly addressed to the staff of Hellenic Ministry of National Defence; nevertheless all

[75] available at http://www.ypeka.gr/LinkClick.aspx?fileticket=sBrl0PLEBPA%3D&tabid=367 (Greek version only)

other interested parties including the public may obtain useful information associated with environmental protection and energy efficiency[76].

- Memorandums of Cooperation on the fields of Environmental Protection and Energy Efficiency.

- Environmental training and knowledge.

- Environmental and energy management issues.

- Database of Environmental Protection and Energy Legislation, Standards, Best Available Techniques and Practices (including other Countries').

- Sustainability in Defence (SiD) Initiative.

- Contests among the military personnel for the best proposal / study on the development of environmental / energy infrastructures within the Hellenic Armed Forces.

- Environmental events and presentations.

- The Development and implementation of Energy Management System to three (3) "pilot study" camps of the Armed Forces started since 2012 (will be presented in details, in Annex B).

To achieve these initiatives and objectives, the MoD's projects, among others, include the development of energy policy in the Armed Forces, the interaction of each project with particular co-financed programs and the training plan expansion project within the camps and other facilities of the MoD.

The revised Environmental Policy of the Ministry is under consultation and expected to be published in the first semester of 2014.

3. Methodology

3.1 General

Previous studies have been used variety of methods to review and evaluate the implementation of EMS in the Defence sector, both quantitative and qualitative.

[76] For more information, email address: greenarmedforces@mod.mil.gr

Quantitative research involves the measurement of environmental performance and this is recognized by many researchers as the biggest challenge concerning the environmental management assessment as well as the EMS implementation process[77].

Qualitative methods may include surveys, interviews, case studies and theoretical analyses using relevant data. The value of a qualitative approach depends largely on the quality of the questionnaires, the response rates and the cooperation of the participants.

However, advantages and disadvantages can be noted in both the aforementioned methods, thus, different research methods might bring different conclusions. It is, therefore, crucial to choose the research instrument cautiously and appropriately, with respect to its features, research aims, required data type, data methods and quality.

Both methods are applicable to the present study. However, it is recognized that there are inherent difficulties in data collection of quantitative and timeline data[78] while there are not sufficient quantitative environmental data available for the Defence sector for analysis. This research, therefore, mainly uses qualitative methods, while combines qualitative and quantitative methods for data processing and analysis. These methods have been used frequently in other studies, particularly in complex military environments[79].

In addition, in order to identify the significant factors that are concerned with successful implementation of EMS in several countries' Armed Forces, a desk based review of literature has been used and questionnaires as well as telephone or personal interviews were took place to evaluate the factors and collect quantitative data from different key authorities. The aforementioned

[77] Hertin, J., Berkhout, F., Wagner, M. & Tyteca, D., (2008), *"Are EMS environmentally effective? The link between environmental management systems and environmental performance in European companies",* Journal of Environmental Planning and Management*, 51*(2), p. 259-283

[78] Edwards, B., Gravender, J., Killmer, A., Schenke, G. & Willis, M., (1999), *"The effectiveness of ISO14001 in the United States, a group project thesis",* University of California, p. 192, http://www2.bren.ucsb.edu/~keller/courses/GP_reports/ISO14001.pdf

[79] Ramos, T.B. and J.J. Melo, (2005), *"Environmental management practices in the defence sector: Assessment of the Portuguese military's environmental profile*", J. Cleaner Product, p.1117-1130. http://www.deepdyve.com/lp/elsevier/environmental-management-practices-in-the-defence-sector-assessment-of-1tEs1BELCf

methods are considered appropriate and were adopted for the present study. The combined results were used to provide recommendations.

3.2 Design and methodology

First of all, an initial review of existing documentation was performed as well as of existing legislation and relevant policies, programs and projects in international level. The number and range of countries and particular policies or programs which were reviewed were determined only after the initial survey in order to gather the approximate number and types of programs in conjunction with the accessibility to review, thus resulting in a representative sample.

A desk-based review of literatures was employed in order to identify the significant factors concerned with the successful development and implementation of EMS in the international military sector. Countries that have already implemented such systems in their Defence policy and activities were reviewed and assessed as case studies, in order to evaluate the effectiveness level of the EMS implementation.

In addition, survey questionnaires as also as telephone structured interviews took place to evaluate the factors and collect quantitative data from the DoD's and key authorities officials in the respective countries, following an initial stakeholder analysis to answer aforementioned research questions. The combined results were used to provide evaluation and recommendations to an EMS implementation framework used by the military sector.

Finally, structured questionnaires and interviews to key authority officials and military personnel, of the Greek Armed Forces were carried out, in order to evaluate the present sustainability awareness level, ensure the top management commitment level and assess the possibilities of effective implementation regarding an EMS. Furthermore, observation and document / record review methods were used to build the existing level (baseline) of the EMS's relevant areas, establish a comprehensive review of the existing environmental issues, impact, performance and footprint of the Greek site activities.

3.3 Rationale of the methodology

There are mainly four types of research instruments which were widely used, including questionnaires, interviews, observation and document / record review; each of them have their own advantages and disadvantages and strengths and weaknesses respectively[80]. The aims and objectives of this research are to study and evaluate existing policies and EMS's implementations as well as to provide recommendations to develop a structure which make it suitable to be developed and used by the Greek MoD. Large amount of data could be drawn from the literature and data from the already adopted programs and policies from other countries.

The method of e-mailing the questionnaires was chosen in this study mainly because the targeted respondents live abroad. However, it was believed that the data obtained by using well organized questionnaire will be representative[81]. E-mailed questionnaires were used to obtain quantitative data from DoD's that are geographically dispersed as well as from NATO authorities.[82] Unfortunately, the response rate proved to be relatively low for reasons which will be discussed later.

Due to time and cost constraints, the postal questionnaire was not considered in this study. Although interviews may provide more detailed understanding, questionnaires were used as the major approach because it was considered more important in drawing conclusions with general ideas, and it would be easier to study differences between the respective countries' policies adopted. It is appropriate to use a questionnaire when the numbers of respondents are large or when they are distributed in many locations[83]. Also, with the questionnaires is feasible to standardize the collected data if the questions are identical, so it is the most productive method among the four main research instruments.

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[80] Denscombe, M. (2003). The Good Research Guide: for small-scale social research projects, 2nd Edn. Open University Press, Maidenhead

[81] Pimenova, P. and R. Van der Vorst. (2004). The Role of Support Programmes and Policies in Improving SMEs Environmental Performance in Developed and Transition Economies. Journal of Cleaner Production, 12: 549-559

[82] Bryman, A. (2004). Social Research Methods, Chapter 3, 2nd Edn. Oxford University Press, Oxford

[83] Denscombe, M. (2003). The Good Research Guide: for small-scale social research projects, 2nd Edn. Open University Press, Maidenhead

To maximize the benefits of the questionnaire, the design of it was user friendly and unbiased; open-ended questions were used but not widespread; background information was clearly given. Finally, each question was designed carefully, and literature was used as guidance in order to avoid projecting researcher's bias into the wording and answer categories.

3.4 Questionnaire Design

The present study used two (2) questionnaires: the first one concerned the key authorities of different countries and organizations while the second the environmental awareness of the Greek Armed Forces' personnel.

The first four part questionnaire, concerning the details of EMS implementation practice and experiences in the Military / Defence sector, includes closed-ended and open-ended questions and questions with scales to choose as well. For the multiple choice questions the participants could pick the answers from the given choices. The "other" option had been included, and spaces for the potential to get additional answers and offer the needed flexibility level to the responses. Part one was designed to get information regarding the respondent's general Environmental Concerns, while the second part was designed to get general information regarding the particular organization. Parts 3 and 4 were divided for organizations certified or not to an EMS.

The second questionnaire, concerning the level of the environmental awareness and concerns among the Military / Defence employees, had been included five parts, containing the same as aforementioned type of questions. This questionnaire is initiated with questions to provide information concerning several environmental issues which may have general impacts and may affect almost everyone and continues with questions to provide answers regarding the concerns and views about global environmental problems. The fifth part was about the respondent's personal information.

Background information, as well as clear instruction about the survey, was given at the beginning of the questionnaire to the respondents to guide them how to answer the question. E-mail address and telephone number were given at the end of the questionnaire for return purpose together with sincere word of thanks. The cover letter was designed with the questionnaire and stresses out the design of the survey and the confidentiality of the respondents.

Questionnaires and Cover letters Samples as well as the interview structured questions are presented in Annex “C” (Appendixes 1 to 3).

3.5 Sampling

The primary boundary of the sampling was that there are no particular databases which could provide the EMS-certified Armed Forces in the international Defence sector. A list of key authority employees regarding the first questionnaire was derived from a NATO document, which proved to be without updated contact information. Since the list did not provide the required contract information, the survey started with an internet-based search for the DoD’s profiles and the corresponding contact person. During the internet searching, the list of adequate countries’ were found to be helpful for the research, and the selected DoDs were contacted by e-mail to solicit information on names and contact details of those who are responsible for the environmental management system. However it should be noted that this does not reflect the actual number of DoDs that are certified or use an EMS. Additionally, besides the research for updated information and the update of some of the information, the limited data bases, was found to be very difficult to extract information of targeted respondents. As a result, they did not provide representative answers and the response rate was very low (4%). Specifically, for the first questionnaire, only 2 out of 50 of the DoDs officials returned their questionnaires. The response rate was exemplary low (4%); therefore, follow-up telephone interviews were carried out in order to acquire acceptable amount of information. As a result, it did not provide representative answers and the response rate remained low. Concluding, the first questionnaire cannot provide any useful results in the present study, and the desk based review results will be discussed in the next chapter.

On the contrary, the response rate of the second questionnaire was relatively high (96%), mainly because of the follow up personal or telephone interview. For the second questionnaire, 53 out of 55 participants returned their questionnaires. The response rate was exemplary great (96%). The rationalization of each question and the data from the questionnaires, analyzed using statistical measures, will be discussed in the next chapter.

3.6 Greek Army Forces' Camp as a "pilot" Study Area

The study area will be introduced and discussed in Annex "B". Furthermore, instead of merely exploring individual environmental issues regarding military impacts, this study focuses on examining the integrated effects of the entire Camp, therefore, a multi-method approach is presented.

4. Presentation of review results in Defence sector

4.1 General

The review and the interviews for the present study showed that many of the NATO members' Armed Forces have adopted an EMS framework based on a certified (ISO, EMAS or other) or not standard system.

Although there are some differences among those because of the particularities of each country, the similarities are evident. For example, USA and Canada have their own EMS, even being an NATO member. This is because some Military Operations are executed only by the army of one that countries.

But, when the Military Operation is driven by NATO, both NATO and each country EMS should be obeyed. It is common sense in all EMS that the Environmental aspects must be considered in the Operational Plans and the routines of Military Organizations. Every member is responsible to take care of the environment and stimulate other people to do the same.

The concept of Sustainable Development is alive in all people on the military in the USA, Canada, and Australia or the NATO structures, even during peace or war times. The Continuous Improvement process is fundamental for the success of an EMS, as established in the PDCA cycle, and most of the NATO Armed Forces have considered and implemented it on their plans in order to better management the environmental aspects of military activities.

The central goal of an EMS should be to offer a holistic and integrated framework for effective environmental management by the different nations' DoDs. To be able to present as the proper tool the needed guidelines. For example, Australian's DoD EMS model is presented in Figure 13. The Australian DoD established a set of specific guidelines and measures

accordingly to the developed EMS in order to facilitate effectively the management of environmental aspects. Many examples of Armed Forces EMS implementation concerning different countries are shown in Table 1[84].

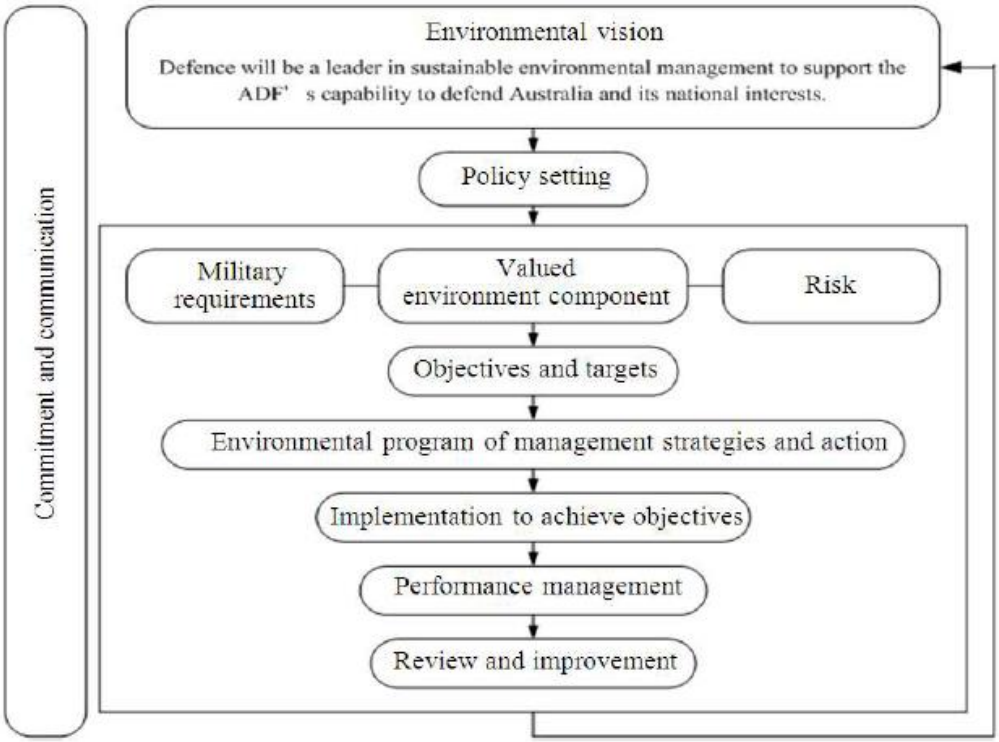


Figure 13 - The ADF EMS model
(source: http://www.defence.gov.au/environment/)

[84] Wang X.H. and W. Wu, (2013) "A review of Environmental management Systems in global defence sectors", American Journal of Environmental Sciences

Table 1 - Different countries' Armed Forces ISO14001 EMS overview (source: http://www.nato.int)

Country	Defence organisation	ISO14001 EMS	Environmental management status	Applied legislation	Principles/guidelines, strategies, policies, programs	Future improvement /Comments
UK	Ministry of Defence (the second largest single-ownership department following the forestry commission; holding more than1%of the land area and 3%of the) national park regions	80% of the government estates with an EMS in place by 2006 (announced on July 24, 2002); Carried out by Army, Navy and Air Force	Formerly relatively poor record, reformed in recent years	N/A	Specific EMS team; strategic guidelines e.g. "implementing environmental management systems guidance for government departments" and "sustainable development in government"); safeguards produced by defence science and technology laboratory, significant environmental impacts identified;management principles regulated	Future improvement: environmental performance indicator development; reporting framework; data collection; public participation
Netherlands	N/A	N/A	N/A		Defence Environmental Policy Plan	N/A
USA	Department of Defense (the third largest landholder)	Executive order (EO 13148) greening the government through Leadership in environmenta management signed calling for the EMS adoption and implementation (April 2000); Adopted by all federa agencies (including defense) with the EPA requirements by the end of 2005; Pilot 16 selected military installations study of 16reporting the extensive use and positive effect of the ISO14001EMS in all defence scopes	No concept in military lands before the 1960s, and changed along with the serious environmenta damage and protection concerns; Responsibility taken over from engineering community(1994)	The clean air act of 1970; federal water pollution control act of 1972 the endangered species act of 1973 the resource conservation and recovery act of 1976; the clean water act of 1977	integrated natural resource management Plans (INRMPs) (1989); the army environmental policy institute (1990); US army environmental strategy into the 21st century(1991); guideline for INRMP preparation (1997); three broad programs (january 2003): environmental impacts integration of INRMPs and the ISO14001 identification EMS; military training area management (e.g. LCTA (land condition trend analysis),maintenance), TRI (training requirements integration), EA (environmental specific programs (e.g. air quality and waste management, noise reduction pollution prevention, fish and wildlife and endangered species management installation restoration and reporting system)	The modern status of USA environmental management commenced with the implementation of the national environmental policy of 1969 and the establishment of he US EPA in 1970.
Canada	Department of National National Defence and the Canadian Forces (DND/CF)	Adopted by Parliament (1995); complete implementation by april 2004; adopted by DND/CF`	N/A	The Canadian environmental assessment the Canadian environmental protectiont	National strategy: the "greening government"	The first Sustainable Development Strategy(SDS) (1997) and second SDS (2000); participant in the NATO-CCMS pilot study
Portugal	Portuguese Ministry of Defence (MDN) (one of largest public sectors; holding about ¼ of the territory)	Adopted (2001); now fully implemented in all defence branches	Military policy not ncluded for a long time; considered more recently	N/A	National plan for environmental policy instituted by the MDN (1995), relevant strategies, training and management measures followed.	Participant in the NATO-CCMS pilot study, future improvement environmental awareness training; environmental baseline survey, environmental impact identification
South Africa	South African national defence Force	Developed	Environmental responsibilities acknowledged 1977	N/A	First environmental policy(1978); sustainable training area management plan; environmental considerations in operations; environmental Implementation plan military integrated environmental Management methodology (1990s)	N/A
Slovak republic	Ministry of Defence	Developed in the armed forces (2001)	Typical military installations chosen as experimental units; Work closely with the ministry of environment	N/A	State Environmental Policy following European legislation (1993); "the conception protection" for defence (1996); pollution sources database for for military Installations" project (2001)	In 2001, a "pollution sources database military installations project began to develop in the armed forces, as an outcome of a nationwide program of 1999
India	N/A	Application required	Military sector incorporated the environmental protection framework (1993)	N/A	Environmental strategies, policies and management plans formulated, well-controlled and publicly available	N/A

4.2 Environmental Performance and EMS

Previous studies have concluded that there is a correlation between the positive outcomes and an EMS implementation. The most notable are both legal compliance and improvement of the environmental awareness. Likewise, the recent both public and research concerns have been focused on the ways of an EMS implementation, if and in what level the respective standards are met and where the improved or not environmental performance is correlated to the EMS itself[85]. The UNCCHDPP final report in 2003 stated, "…it is not simply whether an EMS is in place or has been certified, but what impacts were identified as significant, what objectives and targets were set for their improvement and what actual performance or compliance results have been achieved" [86].

The Organization for Economic Co-operation and Development (OECD) has produced one of the leading guidance documents regarding EMS. Likewise, , the Indonesian Ministry of Environment developed in 1995 a rating system called "Proper Prokasih", in order to enhance EMS implementation. This system has been recognized as "*the first central government program in the world to publish a single index of environmental performance*"[87].

The EMSs are described and widely used as a framework or tool for environmental management. However, its success and the studies which have been conducted, the questions regarding the factors which result in a successful implementation or to what level can be considered as having effective performance, remain with unclear answers and the conclusions are questionable. Significant improvement in environmental performance can be seen in many studies as a result of EMS implementation and many

[85] Wang X.H. and W. Wu, (2013) "A review of Environmental management Systems in global defence sectors", American Journal of Environmental Sciences and Hertin, J., Berkhout, F., Wagner, M. & Tyteca, D., (2008), *"Are EMS environmentally effective? The link between environmental management systems and environmental performance in European companies",* Journal of Environmental Planning and Management*, 51*(2), p. 259-283

[86] UNCCHDPP, (2003), *"Environmental Management Systems: Do they Improve Performance? ",* Project final report, University of North Carolina at Chapel Hill, Chapel Hill, N.C.

[87] Wang X.H. and W. Wu, (2013) "A review of Environmental management Systems in global defence sectors", American Journal of Environmental Sciences and Edwards, B., Gravender, J., Killmer, A., Schenke, G. & Willis, M., (1999), *"The effectiveness of ISO14001 in the United States, a group project thesis",* University of California, p. 192, http://www2.bren.ucsb.edu/~keller/courses/GP_reports/ISO14001.pdf

researchers believe in beneficial linkage between them. On the contrary, other conducted surveys presented that the EMS did not resulted in any improvement of the environmental performance[88].

This can be explained by several reasons like the following: To begin with, an approved and précised definition of the “environmental performance” does not exist. Moreover, the EMS establishes the framework only and the results can be evaluated inside the specific organization’s documented policy, the respective objectives and targets and other requirements[89]. The measurement of the relevant environmental performance may significantly differ, especially when the compliance with regulatory requirements, or the minimization of the impacts and the improvement have to be measured and evaluated. Therefore, the EMS results in performance remain questionable, and the adoption of an EMS seems not the guaranteed “medicine” for maximum environmental performance: there are many that define and affect the levels of efficient EMS implementation.

To continue with, the selection of the tools and methods which are used by the researchers, often result in different procedures and affect the respective results. Generally, a successful EMS has the ability to affect in a positive way many internal and external factors of the organizations, like its features, the management and personnel attitude and ethic, the respective policy as well as the stakeholder contribution and response. Different needed features of a successful EMS are presented below:

- management commitment and integrated approach to cover the majority of environmental aspects,
- integrated and holistic plans and strategies,
- goals, targets and objectives,
- to identify early enough the most serious environmental impacts,
- present the needed response and accordingly with the needed technical support,
- policy and guidelines documentation,

[88] ibid
[89] ISO (2004)

- reviewing, reporting and communication processes,
- transparent follow-up actions and measures,
- personnel and board commitment into everyday

The aforementioned features are considered to crucial for an EMS framework and are recognized as the basic steps to follow when evaluating an EMS of an organization[90].

4.3 Conclusions of Review

The environmental management in the Defence sector activities has been since the recent years considered being important for the environmental performance. But exactly due to the fact that military actions and operations have multitasking and complex characteristics, the environmental issues have to be addressed systematically and in a holistic way[91]. As aforementioned above, the similarities of the equipment, the facilities as well as the procedures between different nations' Armed Forces are remarkably great, so the differences in the EMS establishment and implementation processes are minor. No matter what, the crucial factor is to evaluate how effectively an EMS is adopted rather than whether it follows or not a certified standard. With the review which the present study has examined, to understand the EMS implementation procedures in international military sector, was the main goal.

It can be concluded that there is no "one size fits all" design. An EMS is a complex framework which incorporates different environmental aspects in an integrated way, so a large number of specific criteria are required to measure and evaluate its effectiveness and successful adoption. This is highly depended on various factors. Thus, it is considered difficult to evaluate an EMS using quantitative methods. Although in previous studies, all the methods have been used to assess the effectiveness of an EMS, the quantitative methods always require high quality and expensive to obtain

[90] Wang X.H. and W. Wu, (2013) "A review of Environmental management Systems in global defence sectors", American Journal of Environmental Sciences

[91] Diecidue, T., (2008), Military-to-military collaboration on environmental management: A framework for strategic information, education and communication. Project Performance Corporation, Virginia, USA.

precise quantitative data. Both methods have strengths and weaknesses, so the proper selection of the method to be used has to be done with caution.

It can be also referred that adequate understanding of an EMS's effect into military sector is still something not feasible. The relevant gaps in knowledge as well as the effects and the performance improvement have to be identified and assessed. Thus, further studies are needed in order to develop the respective Indicators which have to be internationally applicable, in order to identify and evaluate the correlation between implementation and performance. Rather than self-assessment by Commanders, independent evaluation from external authorities is recognized as substantially needed and suggested, in order to deliver safe, objective and transparent conclusions.

The internal approaches have the tendency to biased assessments and positive results, and this is the reason that they considered as subjective. Moreover, data and high-quality information are required to establish a sufficient international database, to improve impact assessment and communicate effectively the relevant measuring, monitoring and reporting procedures.

Such a dynamic and complex process like the environmental management requires holistic approaches and abilities in order to respond effectively in every day changes, resulting that way to constant improvement. It is not feasible to promote a single recipe for effective implementation of an EMS. The process requires frequent reviews and respective updates to proactively respond to the demands. Effective interaction will be secured by regular reviews. Concluding, every nation needs to adjust properly the general guidelines in order to find out the optimal framework concerning the EMS into Defence activities[92].

[92]Wang X.H. and W. Wu, (2013) "A review of Environmental management Systems in global defence sectors", American Journal of Environmental Sciences and Hertin, J., Berkhout, F., Wagner, M. & Tyteca, D., (2008), *"Are EMS environmentally effective? The link between environmental management systems and environmental performance in European companies",* Journal of Environmental Planning and Management*, 51*(2), p. 259-283

4.4 Analysis of the Environmental Awareness results

4.4.1 Socio- Demographic characteristics of participants

In Table 2, the Socio- Demographic characteristics of the second questionnaire's participants are presented thoroughly. From the 55 participants, 24 (43, 6 %) were aviators, 21 (38, 2 %) administrative personnel and 8 (14,5 %) were maintenance, while 2 (3,6 %) did respond partially the questions.

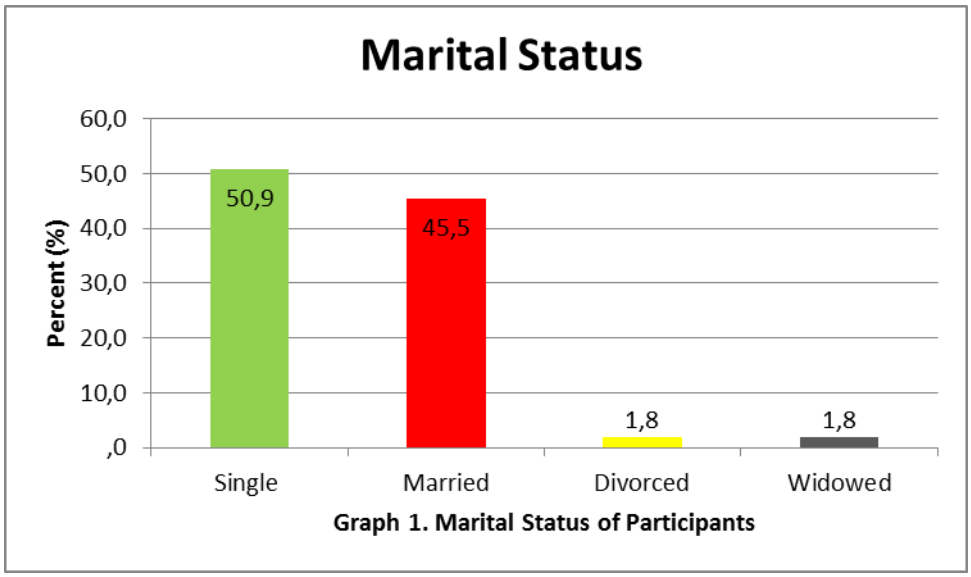
Table 2 - Socio- Demographic

Socio- Demographic Characteristics	**Participants (n= 55)**
	Mean
Age (years)	33,6
Experience (years)	16,1
	n (%)
Sex	
Male	39 (70,9%)
Female	16 (29,1%)
Marital Status	
Single	28 (50,9%)
Married	25 (45,5%)
Divorced	1 (2%)
Widowed	1 (2%)
Number of Children	
None	30 (54,5%)
One	8 (14,5%)
Two	11 (20%)
Three	4 (7,3%)
Four	1 (2%)
No response	1 (2%)
Education Level	
High School (HS)	1 (2%)
Technical Institution (TI)	14 (25,5%)
Undergraduate (UG)	35 (63,6%)
No response	5 (9,1%)
Major	
Aviators	24 (43,6%)

Administrative personnel	21 (38,2%)
Maintenance personnel	8 (14,5)
No response	2 (4%)
Income	
<= 1000€	7 (12,7%)
1000€ - 1500€	19 (34,5%)
1500 € - 2000 €	13 (23,6%)
=> 2000€	11 (20,0%)

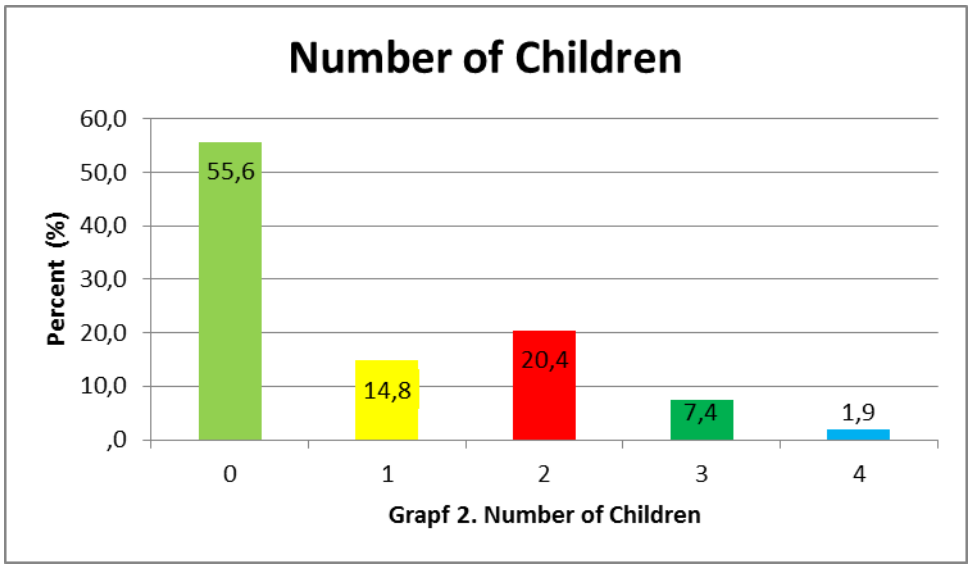
From them, 39 were male (70,9 %) and 16 female (29,1 %), with average age the 33,6 years.

Almost the 50 % (28) of the participants were single, 46 % (25) single and the two of them (4 %) divorced or widowed. (Graph 1).



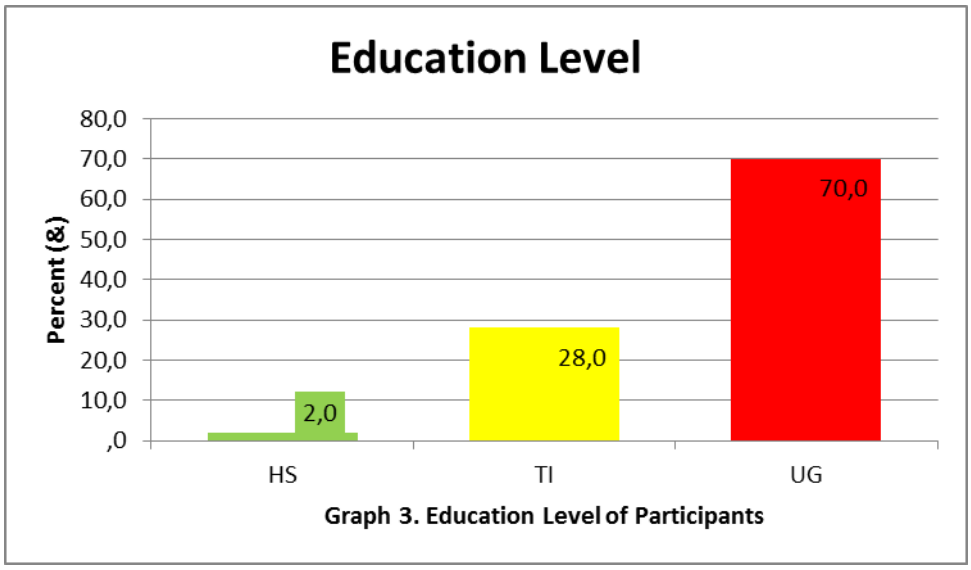
Graph 1: Marital Status

More than half (30, 54,5 %) have no children, 8 (14,5 %) one child, while 11 (20 %) have 2 children, 4 (7 %) three children and one (2 %) had 4 children. (Graph 2).



Graph 2: Number of Children

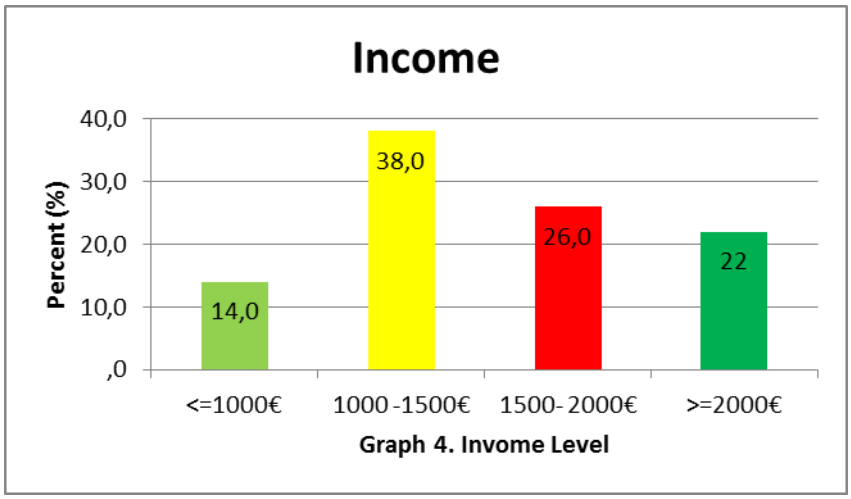
Concerning the education level, 1 (2 %) was high school graduate, the 25,5 % (14) were technical institute graduates and 35 (63,6 %) bachelor degree holders. (Graph 3)



Graph 3: Education Level

Concerning the experience years, the average is 16 years with a maximum the 27 and minimum the 2 years.

Regarding the participants' income level, the results are presented in Graph 4.



Graph 4: Income Level

4.4.2 Data Analysis

The average results of the scores in the first two parts of the questionnaire concerning the Environmental Awareness and Sustainability Initiatives of the participants are presented in the Table 3. The results for the level of Environmental Awareness can be interpreted as following:

- **Score of 19-30:** There are systems and procedures in place that enable personnel to be in compliance, identify opportunities to reduce or avoid costs, and promote sustainability. There is potential need for new ideas to keep the programs on track.

- **Score of 10-18:** There are some systems and procedures in place, but improvements could be made. There need to improve the current programs and achieve the goals.

- **A score of <10:** An Environmental Management System is needed.

In addition, concerning how sustainable are the relevant initiatives, the assessment of the results included the following hypothesis: if you would found yourself starting with a lot of points because your unit / camp has a lot of environmental or sustainability projects, but then found you subtracted points because of a lack of identified responsibilities, goals, measures, and methods, you don't have a system in place to keep the Sustainability Initiative going. Individual projects and initiatives are high, but they are most effective when they are connected with operations, have documented procedures, use measures and are checked to see how they are working.

Table 3 - Average of Environmental Awareness and Sustainability Initiatives

Environmental Awareness	Sustainability Initiatives Starting Point	Sustainability Initiatives End Point
20,15 (3,1)	3,63 (4,6)	3,21 (4,1)

The results showed an exemplary adequate level of Awareness, since the average price was above 19 (20,15).

Table 4 presents the levels of the Environmental Awareness and Sustainability Initiatives among the different categories of the participants and Table 5 presents the participants' general Environmental concerns for several issues.

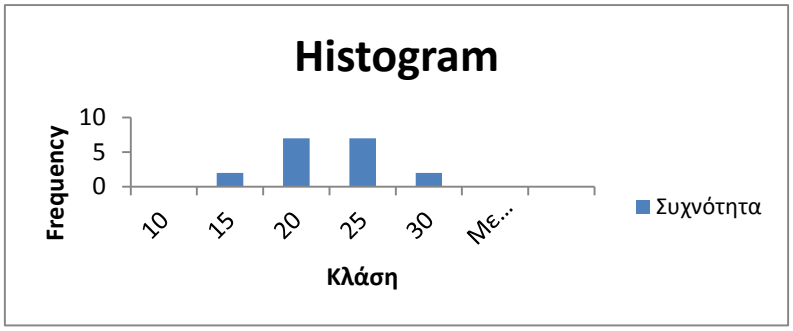
Table 4 - Average of Environmental Awareness and Sustainability Initiatives

Personnel categories	Environmental Awareness	Sustainability Initiatives Starting Point	Sustainability Initiatives End Point
	Average		
Aviators	22,2	3,91	3,71
Maintenance	17,44	2,68	2,47
Administrative	20,81	3,31	3,45
P value	0,302	0,003	0,001

Table 5 - General Environmental Concerns

General Environmental Concerns	Participants (n=55)		
	Yes	No	Do not Know
	n (%)		
In your personal view, has air pollution ever affected your health?	33 (60,0%)	12 (21,8%)	9 (16,3%)
Apart from effects on people's health, are you aware of any other effects of air pollution?	27 (49,0%)	9 (16,3%)	15 (27,3%)
Have you heard of "climate change"?	54 (98,2%)	1 (1,8%)	0 (0%)
Is the issue of climate change important to you personally?	36 (65,4%)	1 (1,7%)	18 (32,7%)

The total score of Environmental Awareness had an average of 20,15 with a range from 14 to 26 (Graph 5).



Graph 5: Average of Environmental Awareness

There was not found statistically correlation between male and female and level of Environmental Awareness (p=0,5). Likewise, between professional category (p=0,302) or age (p=0,14) and level of Environmental Awareness. On the contrary, correlation was found between the number of children and Environmental Awareness level of participants (p=0,01), while the marital status does not seem to be correlated (p=0,09). Finally, there are not big differences regarding the educational level (p= 0,615) or the income level (p= 0,11).

Table 6 presents the participants' general Environmental views for several issues, and Table 7 the Environmental Activities which the participants may take part.

Table 6 - General Environmental Views

General Environmental Views	Participants (n=55)				
	Totally Agree (1)	(2)	(3)	(4)	Totally Disagree (5)
	n (%)				
Jobs today are more important than protecting the environment for the future	5 (9%)	3 (5%)	12 (22%)	14 (26%)	19 (34%)
I am unwilling to make personal sacrifices for the sake of the environment	6 (11%)	6 (11%)	9 (16%)	17 (32%)	15 (28%)
If my job caused environmental problems, i'd rather be unemployed than carry on causing them	6 (11%)	3 (5%)	22 (41%)	9 (16%)	13 (24%)
Having a car is part of having a good lifestyle	3 (5%)	13 (23%)	20 (36%)	13 (24%)	4 (7%)
Humans have the right to modify the natural environment to suit their needs	0 (0%)	3 (5%)	14 (26%)	12 (22%)	23 (40%)
Humans are severely abusing the planet	31 (56%)	6 (11%)	12 (22%)	3 (5%)	

					1 (2%)
Nature is strong enough to cope with the impact of modern industrial nations	4 (8%)	17 (31%)	9 (16%)	6 (11%)	17 (31%)
The balance of nature is very delicate and easily upset	20 (36%)	11 (21%)	9 (16%)	6 (11%)	7 (13%)

Table 7 - Potential Environmental Activities

Potential Environmental Activities	Participants (n=55) n (%)
Walk or cycle to work	15 (27%)
Turn off lights I'm not using	51 (93%)
Use public transport	21 (38%)
Buy energy efficient light bulbs	51 (93%)
Buy organic food	12 (24%)
Recycle glass	30 (55%)
Recycle other items	39 (70%)
Take part in a campaign about an environmental issue	9 (16%)

5. Discussion

Often, the environments in which military activities occur have an adverse effect. The environmental damage to the environment due to the military actions can seriously threaten and affect the habitats and the ecosystem and finally may cause instability. Protection of the physical and natural environment, where military activities, operations and training actions take place should play a substantial role among the Defence sector and the responsibility has to be taken into account in every planning process.

The Armed Forces own ship land and facilities surroundings may host a wide range of biodiversity and various flora and fauna species, from birds and plants to riverside life and mammals. The NATO has been presented serious work and study groups in order to be able and enhance the natural environment protection levels, where it is needed and the Alliance operates. Important tools during this process and key factor for the so far progress are

the new technology achievements, the ongoing researches, the implementation of relevant structures and frameworks in accordance with standardization and documentation of the tactics and procedures as well as the training sessions.

NATO members are committed to set the most reasonably methods and measures for achieving the needed level of environment protection, while at the same time they should fulfill Alliance's military goals and objectives and secure the global peace according to its mission. The above measures may include various actions like hazardous materials installations, water and waste management policies, reduced energy costs and minimized energy consumption levels, to adoption of relevant management systems into military activities or even into the operational theatre.[93]

This can be achieved only if the Commanding officers do not have knowledge gaps concerning these activities which correlate in many ways with the environment. Certain policies and specific documented rules have been developed and adopted by NATO Alliance's members, thus, reflecting the increasing level of environmental awareness. Likewise, the Alliance is constantly struggling to communicate and facilitate the integration of relevant standards and environmental management systems into all NATO military actions, activities and facilities.

Accordingly, the present work shows that most of the NATO members' Armed Forces have adopted an EMS framework, certified or not, while the vast majority of them is based on the ISO 14001 Standard. Although there are some differences among those EMS, because of the particularities of each one, the similarities are apparent. It is a common sense that the environmental aspects must be considered in every operational plan as well as in the routines of military organizations. Every member is responsible to take care of the environment and stimulate other people to do the same. The concept of Sustainable Development is alive in all people on the military personnel even during peace or war times. The continuous improvement process is essential for the success of an EMS, as found in the PDCA cycle, and all the Armies and the NATO Alliance have considered and implemented

[93] www.nato.int

it on their plans in order to better management the environmental aspects of military activities.

Concerning the Hellenic MoD, the present work shows that several initiatives and programs have been already implemented. Many Directives and regulations have been released and green approaches have been followed. Likewise, the environmental awareness level of the Hellenic military personnel seems to be exemplary high, showing that the proper preconditions exist and the current eco-friendly personnel culture can help in implementing an EMS and move to next step forward the MoD's Environmental Policy and management.

6. Limitations, conclusions and recommendations

6.1 Limitations

Some major limitations of the questionnaires are the representativeness of the sample, the low response rate for the first questionnaire and the fact that it was difficult to control it, once the questionnaire was sent[94]. These limitations, the present study tried to minimize with the structured interviews. In addition, the lack of up-dated and united database regarding the implementation of certified EMS in the Defence sector was finally one of the greatest obstacles in this research.

Regarding the above limitations, the present study tried to reduce them with the structured interviews and the physical presence of the interviewer. In addition, the possible lack of updated and united database regarding the implementation of certified EMS in the global military sector was also one of the substantial obstacles in this research. Additionally, the rate of response was likely to be low[95]; usually, surveys with over 30% are rare, and the rates are usually between 5 – 10 percent only. Unfortunately, the assumption that if the questionnaires were sent to ministerial authorities would have been a positive factor for the response rate proved to be false. Besides the follow up calls and e-mail to the authorities were made, in order to improve the response rate, the results were not much more positive.

[94] Denscombe, M. (2003). The Good Research Guide: for small-scale social research projects, 2nd Edn. Open University Press, Maidenhead

[95] ibid

On the contrary, among the Greek military personnel that are not used to answer to questionnaires, and there is always the fear of publishing opinions and answers, the response rate was rather than greater. The fear for the Greek military personnel who are not used to answer to questionnaires proved to be inadequate. Follow up calls and e-mails were made to maximize the response rate. Likewise, many studies pointed out interviews would be able to achieve an acceptable response rate and gather in-depth insight into the research topic[96].

Furthermore, once the questionnaire is distributed, the researcher has no control on who is going to complete it, and in addition, there is general privacy protection policy in the military sector in most of the countries, and DoDs refuse to provide information about their policies. Moreover, the data obtained from the questionnaire may be highly affected by the respondent's knowledge and experience; thus, the returned questionnaires may possibly provide insufficient data for the study.

Concluding, during the present research, the real problem proved to be the suspiciousness of the authority people of the Defense sector, which are not used to answer to surveys and questionnaires and the fear of publishing their opinions and answers. Most important, the disclosure issues resulted negatively in the response rate and the requested material. The bureaucracy and disclosure rules proved great limitations not only regarding the Hellenic Mod but the respective other countries' also. The data which were substantial for the progress of this research were finally obtained only after three months since the initial letter of request (Annex "C" - Appendix 4), not to mention the disclosure restrictions.

6.2 Conclusions and recommendations

An EMS is a holistic approach which allows for environmental considerations to be integrated and incorporated into the everyday life and decisions of an Organization. It establishes the proper framework of an environmental program and provides the directions for the planning, doing, checking, monitoring, evaluation, communication and updating of the

[96] ibid

environmental program. It should be the component of the overall management system that integrates environmental aspects in its processes.

The environmental footprint of the military sector will need to be examined holistically. This will provide relevant feedback and potentially will generate information that forms the basis for environmental policies and adequate protection measures. However, the most common officials' misunderstanding is the thought that the needed environmental measures are part of the management system, and not an integrated result of the implementation of it.

Taking expensive but inappropriate measures, like for instance the Hellenic MoD does, to protect the environment and reduce the energy costs without those measures being part of the overall EMS system, is the most effective reaction. Taking the appropriate measures in an integrative model has to be a consequence and the result of the effective implementation of an EMS. The management system usually unveils their necessity early enough, so that the particular decisions on submitting proactive effective action can be made by the Defence authority itself instead of reacting to external interference at unexpected time. In addition, the expected results of the measures must be known to the top level officials and the top management, therefore, should present commitment and offer the proper strategic planning as well as effective control and measure mechanisms which are more than required. And this is exactly the core value and the main goal of the environmental management systems.

In the beginning, the military authorities should take into account both Defence and environment demands and the way these to interact. This relationship will strongly influence the view while developing an EMS, thus affecting the successful implementation of it. The primary role of military sector is the military Defence; thus the primary consideration is to serve and protect the security and global peace. Therefore, other priorities like environmental will always hold less important attention. Moreover, the military activities are unavoidably multitasking and while the primary consideration of them is security and defence, the military organizations are continual increasingly have to comply with regulatory boundaries in order to protect and preserve the environmental resources.

Moreover, the Defence sector should act in a more sustainable ways for the following:

- Sustainable approaches will ensure the long run of the military activities.
- Eco-friendly approaches will improve the image of the Armed Forces to the public and enhance their bounds.
- Reduced costs will be the outcome of the effective resources management.

The aforementioned approaches and management should be considered as a tool. The key authorities' officials should try to address these concepts to the personnel before and not only after adopting an EMS. Decision-making process of everyday operations can include integrated methods into all levels. So, it should be considered as chance to reduce costs and gain benefits and finally save money.

But to shift the perspectives, military sector should be able to watch tangible savings. Just then, effective practices will take place in everyday military life. The actions as well the commitment of top level members have a substantial role to play.

Moreover, the Defence sector should adopt a greener approach for other reasons, as well. First, sustainable environmental management in training areas will ensure that the quality of land resources is maintained for the future. In addition, incorporating greener practices will improve public relations and may have financial benefits such as reducing energy costs and clean-up, disposal or other similar costs. The Environmental management should be considered as a tool, not a hindrance. The key authorities' officials should investigate integrating methods into all levels of decision-making everyday operations. They should treat the environment as an integrated subset of defence, rather than a separate issue.

To be achievable and change the perspectives, military sector and the personnel should be able to count the benefits of changing in tangible manners. Just then, effective practices will become nature. The reaction and

support of top level members will play a substantial role in whether or not an organization successfully adopts and implements an EMS[97].

The Defence sector's Environmental Programs and its EMS systems are extensive and complex. Overall, they reflect the major components of ISO 14001 standard. The respective Environmental Programs also address other not typically required regulatory requirements. For instance "*the National Environmental Policy Act*". However, the assessment of the ISO 14001 standard features shows the possible but minor differences among them and Defence sector policies.[98] The possible but minor differences may include the lack of:

- Unified documentation concerning the policies guidelines
- an unified external assessment system,
- constantly reviewed and updated Directives and Regulations,
- directives which always comply with current legislative requirements and
- a unified environment officer career matrix and training program sessions.

The aforementioned potential differences with the ISO 14001 standard features can be described as next:

- Description of the components of Armed Forces' EMS with the development of an overarching document which integrates the various existing guidelines, directives, plans, scheduled actions and Army Regulations[99].
- Present a unified method for identifying, the military activities' most significant environmental aspects that should be considered the sooner and result in setting the proper goals and targets[100].

[97] www.nato.int
[98] www.aepi.army.mil
[99] ISO 14001 Element 4.4.4, EMS Documentation
[100] ISO 14001 Element 4.3.1, Environmental Aspects

- Present an overarching list of goals, objectives and targets that are set by different Defence sectors. A process is required to communicate the list among the military key authorities and publicly[101].

- Define the DoD's environmental training needs and schedule the proper sessions in Regulation or Directives[102].

- Establish a constant and transparent system for evaluating the EMS which provides adequate feedback information concerning its effectiveness[103].

This study's goal was to support the Hellenic military sector and personnel in identifying the methods and managements systems to be used in integrating environmental concerns throughout the life cycle of every operation and action. The incorporation of all environmental aspects into all domains like the training programs, the operational planning process and execution is crucial and important for sustaining and enhancing the well-being of the personnel and the long run of the Armed Forces. The multitasking and complex characteristics of every military activity always result in having environmental impacts to the extent to which each factor is enabled and to what level.

This study reflect nothing more that the author's thoughts and conclusions and does not express the national and official policies of the Greek or other government. It only reflects and provides combined knowledge, information and recommendations. Hopefully, the recommendations will provide a useful initial point and a basic structure framework for the environmental considerations of the national Defence sector.

[101] ISO 14001 Element 4.3.3, Objectives and Targets
[102] ISO 14001 Element 4.4.2, Training, Awareness and Competence
[103] ISO 14001 Element 4.5.4, EMS Audit

Bibliography

Anton, W.R.Q., G. Deltas and M. Khanna, (2004), Incentives for environmental self-regulation and implications for environmental performance. J. Environ. Econ. Manage., 48: 632-654. http://ideas.repec.org/a/eee/jeeman/v48y2004i1p632-654.html

Arimura, T.H., A. Hibiki and H. Katayama, (2008), Is a voluntary approach an effective environmental policy instrument? A case for environmental management systems. http://www.rff.org/documents/RFF-DP-07-31.pdf

Australian DoD, 2000. ISO14001 Environmental management systems pilot study final report April 2000.

Australian DoD, 2002. Defense Environmental Quality Program Annual Report to Congress-Fiscal Year 2002- Environmental Management Systems. http://www.denix.osd.mil/arc/

Bowling, C. M.., Lavonen, E. & Salestrand, J., (2008), *"Environmental Guidebook for Military Operational"*

Broderick, K., (2008), Adaptive management for water quality improvement in the Great Barrier Reef catchments: Learning on the edge. Geographical Res. http://onlinelibrary.wiley.com/doi/10.1111/j.1745-5871.2008.00525.x/pdf

Bryman, A., (2004), Social Research Methods, Chapter 3, 2nd Edn. Oxford University Press, Oxford

BSI (British Standards Institution), (2011), "BS 7750:1994: Specification for environmental management systems". http://shop.bsigroup.com/en/ProductDetail/?pid=000000000000322818.

Canadian Land Force Command, (2008), *"Environmental Management System"*

Cheesbrough, M., (2006), The results of the remas project- remas layman's report.

Coglianese C, Nash J., (2001), Regulating from the Inside: Can Environmental Management Systems Achieve Policy Goals? Washington DC, p.31-61

Dahlstrom, K., C. Howes, P. Leinster and J. Skea, (2003), Environmental management systems and company performance: Assessing the case for extending risk based regulation. Eur. Environ., 13: 187-203. DOI:10.1002/eet.323 http://onlinelibrary.wiley.com/doi/10.1002/eet.323/pdf

Dawson, M., (2004), Environmental Management Systems (EMS) in the Military Sector-Promoting Broader Implementation. In: Defense and the Environment: Effective Scientific Communication, Mahutova, K., J.J. Barich and R.A. Kreizenbeck (Eds.), Springer, Dordrecht, ISBN-10: 1402020821, pp: 75-83.

Defence Environmental Strategic Plan 2010-2014 . Australian Government, DoD, http://www.defence.gov.au/environment/strat_plan.pdf

Denscombe, M. (2003), The Good Research Guide: for small-scale social research projects, 2nd Edn. Open University Press, Maidenhead.

Determining Factors for ISO14001 EMS, Implementation among SMEs in Malaysia: A Resource Based View

Diecidue, T., (2008), Military-to-military collaboration on environmental management: A framework for strategic information, education and communication. Project Performance Corporation, Virginia, USA.

DNPA, (2005), Dartmoor and its military use: 2005 status. Dartmoor National Park Authority. http://www.dartmoor-npa.gov.uk/__data/assets/pdf_file/0012/43104/laf-state-of-the-park-report5.pdf

Doxford, D. and J. Savege, (1995), The proposed development of Otterburn Military Training Area in Northumberland National Park: A national perspective. J. Environ. Plann. Manage., 38: 551-560. DOI: 10.1080/09640569512814

Doxford, D. and T. Hill, (1998), Land use for military training in the UK: The current situation, likely developments and possible alternatives. J. Environ. Plann. Manage., 41: 279-297. DOI:10.1080/09640569811597

Drechsler, P. (2006), “The forgotten front in war on waste”. http://news.bbc.co.uk/1/hi/sci/tech/5220220.stm,

“Drivers, Designs, and Consequences of Environmental Management Systems: Research Findings To Date From the National Database on Environmental Management Systems”, A Research Compendium, March, 2001, University of North Carolina at Chapel Hill and the Environmental Law Institute in Cooperation with the United States Environmental Protection Agency, and the Multi-State Working Group on Environmental Management Systems

DSEWPaC, (2008), Model environmental management system for Australian Government agencies. Department of Sustainability, Environment, Water, Population and Communities. http://www.environment.gov.au/water/

Durant, R.F., (2007), The Greening of the U.S. Military: Environmental Policy, National Security and Organizational Change. 1st Edn., Georgetown University Press, Washington D.C., ISBN-10:1589011538, pp: 298

Edwards, B., Gravender, J., Killmer, A., Schenke, G. & Willis, M., (1999), *“The effectiveness of ISO14001 in the United States, a group project thesis”,* University of California, p. 192, http://www2.bren.ucsb.edu/~keller/courses/GP_reports/ISO14001.pdf

EMSolution (2002), “Environmental aspect/impact guidance web”. http://www.solutionfoundry.com/aspects/default.htm.

EPD (Environmental Protection Department), (2004), Support on Environmental Management Information and ISO14001 Environmental Management Systems for Small and Medium Enterprises in the Electrical/Electronic and Construction Sectors in Hong Kong. Business Environment Council Ltd, Hong Kong.

http://www.epd.gov.hk/epd/misc/env_management_sme/eng/pdf/Construction%20review%20report/report.pdf.

EPD (Environmental Protection Department), (2009), “Clean air for a cool Hong Kong”. http://www.epd.gov.hk/epd/english/action_blue_sky/action_blue_sky.html.

EPD (Environmental Protection Department) (2011), “The Directory of ISO 14001 Certified Companies in Hong Kong”. http://www.epd.gov.hk/epd/english/how_help/tools_ems/iso14001.html.

Fink, A. (2003b), The Survey Handbook, 2nd Edn. Sage Publications Inc., London.

Ferro A.C.M, (2012), Environmental Management System (EMS) for Military activities – strategies and policies for American, Canadian, Brazilian and NATO armies, Ontario International Development Agency, ISSN 1923-6662 (online). http://www.ssrn.com/link/OIDA-Intl-Journal-Sustainable-Dev.html

Hertin, J., Berkhout, F., Wagner, M. & Tyteca, D., (2008), *“Are EMS environmentally effective? The link between environmental management systems and environmental performance in European companies”,* Journal of Environmental Planning and Management*, 51*(2), p. 259-283

IEMA (Institute of Environmental Management and Assessment), (2011a), “Environmental Management Systems - Your A - Z guide: Introducing EMAS”. http://www.iema.net/ems/emas.

IEMA (Institute of Environmental Management and Assessment), (2011b), “Environmental Management Systems - Your A - Z guide: The ISO 14000 Environmental Management Series”. http://www.iema.net/ems/iso14001/iso14000.

IEMA (Institute of Environmental Management and Assessment), (2011c), “Environmental Management Systems - Your A - Z guide: ISO14001”. http://www.iema.net/ems/iso14001.

ISO (International Organization for Standardization), (2000), The ISO Survey of ISO 9000 and ISO 14000 Certificates: Tenth cycle: up to and including 31 December 2000. ISO, Geneva.

ISO (International Organization for Standardization), (2009), "The ISO Survey – 2008". https://za.dqs-ul.com/fileadmin/files/za/Documents/Content/survey_2008.pdf.

Kolk, A. and A. Mauser, (2002), The evolution of environmental management: From stage models to performance evaluation. Bus. Strategy Environ., 11: 14-31. http://onlinelibrary.wiley.com/doi/10.1002/bse.316/pdf

Lehman, R.N., K. Steenhof, M.N. Kochert and L.B. Carpenter, (1999), Effects of military training activities on shrub-steppe raptors in southwestern Idaho, USA. Environ. Manage., 23: 409-417. DOI: 10.1007/s002679900196 http://www.researchgate.net/publication/226001046_Effects_of_Military_Training_Activities_on_Shrub-steppe_Raptors_in_Southwestern_Idaho_USA

Madu, C.N., Environmental Planning and Management, Pace University, New York, ISBN: 978-1-86094-671-4

Marshall Cavendish Business Information, (2008), "Certified Companies : ISO 14001:2004". http://www.buildersdirectory.com.hk/catid-CM-dirid-94-classid-4001-name-ISO+140012004-mid-673-Classifications_MG.aspx, last accessed 20th June 2011.

NATO-CCMS, (2000). Pilot study on environmental management systems in the military sector. http://www.nato.int/science/publication/publi/envmil/envmil2.pdf

NATO, (2001), *"The AJEPP-2 – Allied Joint Environmental Protection Publication - Best Environmental Protection Practices for Military Compounds in NATO Operations",* (STANAG 2582 - Standardization Agreement 2582)

NATO, (2008), *"Environmental Aspects of Military Compounds",* Phase II. NATO / SPS Short Term Project

NATO,(2011), *"The AJEPP-3 – Allied Joint Environmental Protection Publication - Environmental Management System in NATO Operations",* (STANAG 2582- Standardization Agreement 2582)

NHDES, (2002), Research into the effectiveness of environmental management systems. US Environmental Protection Agency, Region I, New England. http://des.nh.gov/organization/commissioner/pip/publications/co/documents/nhdes-01-3.pdf

Parasuraman, A., Zeithaml V.A. and Berry, L.L. (1998), SERVQUAL: a multiple-item scale for measuring consumer perceptions of service quality. *Journal of Retailing 64(1), pp.12-40.*

Peglau, R., (1999), "Worldwide number of ISO14001". http://www.ecology.or.jp/isoworld/english/analy14k.htm.

Pimenova, P. and R. Van der Vorst, (2004), The Role of Support Programmes and Policies in Improving SMEs Environmental Performance in Developed and Transition Economies. Journal of Cleaner Production, 12: 549-559.

Privy Council Office and the Canadian Environmental Assessment Agency, (2004), *"Strategic Environmental Assessment – The Cabinet Directive on the Environment Assessment of Policy, Plans and program Proposals – Guideline for Implementing the Cabinet Directive"*

Ramos, T.B. and J.J. Melo, (2005), Environmental management practices in the defence sector: Assessment of the Portuguese military's environmental profile. J. Cleaner Product., 13: 1117-1130. http://www.deepdyve.com/lp/elsevier/environmental-management-practices-in-the-defence-sector-assessment-of-1tEs1BELCf

Ramos, T.B. and J.J. Melo, (2006), Developing and implementing an environmental performance index for the Portuguese military. Bus. Strategy Environ., 15: 71-86. http://onlinelibrary.wiley.com/doi/10.1002/bse.440/pdf

Ramos, T.B., I. Alves, R. Subtil and J.J. de Melo, (2009), The state of environmental performance evaluation in the public sector: The case of the Portuguese defence sector. J. Cleaner Product., 17: 36-52. DOI: 10.1016/j.jclepro

Rao, N.H., (2005), Environmental management: Relevance and implications for management of defence installations for sustainability. Curr. Sci., 88: 1753-1758. http://eurekamag.com/research/012/043/

Roos, I. (1999) Switching processes in customer relationships. *Journal of Service Research 2(1), pp.68-85.*

Sheldon C., Yoxon M., (2006), Environmental Management Systems: A Step-by-Step Guide to Implementation and Maintenance, 3rd ed, Earth Scan, London, Ch. 1

Sinclair, R. and R. Tschirhart, 2001. Army Environmental Policy and ISO 14001. Federal Facilities Environ. J., 12: 53-65.

U.S. Army, (2004), *"The Army Strategy for the Environment: Sustain the Mission – Secure the Future"*

U.S. Army Environmental Center, (2004), *"Environmental Management Systems – Aspect and Impact Methodology for Army Training Ranges"*

U.S. Army Environmental Center, (2005),*" U.S. Army Environmental Management System – Implementers Guide"*

Wang, G., G. Gertner, H. Howard and A. Anderson, (2008), Optimal spatial resolution for collection of ground data and multi-sensor image mapping of a soil erosion cover factor. J. Environ. Manage., 88:1088-1098. DOI:10.1016, http://europepmc.org

Wu, W., X.H. Wang, D. Paull and J. Kesby, (2010), Defence force activities in marine protected areas: Environmental management of Shoalwater Bay Training Area, Queensland, Australia. Chinese J.

Wang X.H. and W. Wu, (2013) "A review of Environmental management Systems in global defence sectors", American Journal of Environmental Sciences

Useful Web Links

www.bja.evaluationwebsite.org Performance measurement.

www.ctdol.state.ct.us Overview of performance measurement.

www.cgli.org/environmental.html Council of Great Lakes Industries: Focuses on industrial use of Environmental Management Systems from TQEM to ISO 14000.

www.csubak.edu/iems Institute of Environmental Management Systems: Virtual enviro-library, international meetings on the internet, and environmental internet degree programs.

www.cutter.com Cutter Information Corp: Resources for Environment & Business Professionals and they publish ISO 14000 Update each month.

www.deb.uminho.pt/fontes/enviroinfo/ Environmental Information Sources: Sustainable development (virtual library), US Dept of Energy Pollution Prevention Clearinghouse, Global Environmental Management Initiative, Centre for Alternative Technology, and Centre for Sustainable Development.

www.doe.ca/envhome.html Environment Canada's "The Green Lane": Environmental priorities, environmental assessment guidelines, eco-communities, and news releases.

www.eea.dk European Environment Agency: Reports, articles, brochures and papers, news, stories.

www.epa.gov US Environmental Protection Agency.

www.eutech.co.uk Safety Health & Environment(SHE): Describes a SHE Management System and their implementation.

www.exit109.com FAQ about ISO 14000 and links to sites which can provide additional information on EMS.

www.greenware.ca Greenware Environmental Systems Inc: Provides an overview of ISO 14000, importance of an EMS and describes software that could be used to facilitate implementation.

www.gza.net/iso14000 GZA- GeoEnvironmental Inc: Strategic environmental management, information management and technology and ISO 14000.

www.ifi.co.uk/main.htm Environmental Business: News, management, compliance guidance, and UK's leading environmental publishing house.

www.indcom.gov.au Performance measures for councils.

www.iso14000.com Contains books, journals, newsletters, professional articles and links to other sites.

www.iso14000.net Global Environmental Technology Center: ISO 14000 training ISO 14000 implementation, general ISO news and tools to implement ISO 14000.

www.itpolicy.gsa.gov/mkm/pathways Links to measurement websites.

www.home.mira.net/~mpitcher/ems.html Describes systems standards, general requirements of an EMS and provides an excellent on-line EMS implementation manual.

www.mcb.co.uk/services/articles Performance measurement & organizational design.

www.nasbo.org/process/peform Performance measurement resource.

www.nato.int/ccms Environmental Management Systems in the Military Sector: Describes the pilot study, identifies briefings and reports and Calendar of events.

www.nec.co.jp/english/profile NEC Eco Action Plan: NEC (Japan) describes their environmental management activities, focusing on performance measures.

www.npr.gov/library/papers/benchmrk National performance review.

http://www.ntis.gov

www.ofee.gov Office of the Federal Environmental Executive: Mission, Environmental Executive Orders, breaking news from White House, best practices, and important meetings.

www.quality.co.uk Environmental Management Systems: Background and history on the development of ISO 14000, benefits of EMSs, ingredients of an EMS and sustainable development.

www.rec.org Regional Environmental Center: Looks at EMS strategies for businesses in Central and Eastern Europe.

www.region.peel.on.ca Corporate performance measurement.

www.scc.ca Standards Council of Canada: ISO 14000.

www.tnworld.com Test & measurement world.

www.trst.com Transformation Strategies: Articles, bookstore, case studies, concepts, gap analysis methods, and an excellent web questionnaire for assessing how well prepared you are for implementing an EMS.

www.usserve.us.kpmg.com KPMG: Strategic EMS and how it should be developed.

www.web.net/ecoeco/14000.htm Ecological Economics: Articles on EMSs and links to other ISO 14000 information.

www.wicklow.ie/avoca/ems Environmental Management Systems: What is an EMS? EMS Standards, aspects of an EMS, and implementation.

www.virtualoffice.ic.ge.ca Canadian Business Environmental Performance Office: Provides an overview of EMS and provides additional links.

Annex “A”

“Environmental Guidelines for Defence sector”

Foreword

These guidelines were developed to share a commitment to proactively reduce the environmental impacts of military operations, and to protect the health and safety of deployed forces.

Any successful military operation begins with sound planning. These guidelines give operational planners the necessary tools to incorporate environmental considerations throughout the life cycle of the operation. Failure to integrate environmental considerations into operational- and tactical-level planning increases the risk to the health and safety of military personnel and civilian non-combatants. Inadvertent damage to the natural environment or to significant cultural or historic resources also complicates the attainment of the desired strategic end state through the loss of political capital, negative public image, and increased overall cost.

This document is intended to serve as an environmental guidebook to help Defence sector with environmental management responsibilities, to identify relevant environmental requirements, practices, standards, and preventive measures, with the goal of integrating them into the planning and execution of military operations in a way that enhances the readiness of the force and accomplishment of the overall mission. It provides overarching principles, guidelines, templates, and examples.

Overview

Military operations as well as peacetime domestic routines or training activities present unique challenges. Although operational requirements are paramount, the integration of environmental considerations into all aspects of operational planning, training, and execution is essential. In addition, early environmental planning and continuous risk management are critical for preventing irreparable damage. Most military operations are characterized by generally recognized phases. In broad terms, these phases may be defined as **planning**, **pre-deployment**, **deployment (execution and force rotation)**, **redeployment**, and **post-deployment** (Figure 14).

Figure 14 - Life Cycle of Military Operations

Commander's Responsibilities

Commanders are ultimately responsible for the integration of environmental considerations during the training and planning for a military mission and during the conduct of operations. They must demonstrate leadership and promote environmental awareness throughout their chain of command, and ensure that environmental experts within the military staff are fully involved. Commanders must also ensure that the forces receive the appropriate levels of environmental awareness and technical training. This involves the identification and assignment of clear *responsibilities* and *resources* to provide effective and proactive environmental management. An officer with sufficient knowledge and experience in environmental protection should be designated by the commander as the primary point of contact for environmental issues. The expert's focus should be the development and implementation of an Environmental Management Plan.[104]

[104] *"Annex C to NATO STANAG 7141 EP (edition 4)"*, Joint NATO Doctrine for Environmental Protection during NATO Led Military Activities

Environmental Policy

Environmental policy for military operations is typically characterized by principles for environmental protection which often includes the following:

- The tenet that environmental protection is every person's responsibility
- Compliance with applicable legal requirements, including international agreements
- Recognition of the value of environmental planning
- The goal of minimizing environmental damage
- A respect for local environmental standards
- The minimization of waste streams by wisely using raw materials, hazardous substances, energy, water, etc.
- Effective handling and storage of hazardous substances
- Timely response to environmental incidents to mitigate impacts
- Minimizing noise and other safety hazards

Commanders and unit leaders should, therefore, be aware of all relevant policy, and should define the policy requirements through a memorandum of intent, published Standard Operating Procedures (SOPs), or other similar directive. References to all relevant policy should be included in the Operations Plan (OPLAN)[105].

Legal Considerations

Compliance with applicable environmental laws and regulations is a necessary cost of doing business, even during military operations. Often national environmental regulations do not specifically apply to force engaged in military operations in another country. This is not always the case, however, and the extent to which national laws and regulations apply extraterritorially will vary from nation to nation. Commanders and their designated environmental officers, therefore, must make every effort to understand their

[105] To fully understand environmental policy statements, refer to the example developed by EUFOR for HQEUFOR/NHQS, a peace support operation.

legal requirements, and examine the applicability of their national law, international law and conventions, and the regulations of multinational or supranational bodies such as the European Union or the United Nations.

Operational Planning

Once the political and military decision has been made to participate in a military operation, environmental considerations should be incorporated into each phase of the planning process. The requirement for information early in the planning process reinforces the value of feedback on environmental issues from previous operations in the form of lessons learned. In addition, information may be gathered from a variety of other sources, including:

- Geographic information systems (GIS) data.
- Legal documents.
- Interaction with NGOs, host nation authorities or subject matter experts, civil-military cooperation (CIMIC) groups.
- Open source data.
- Intelligence assets.

To understand how the EMS is to be integrated into the planning cycle, the Environmental Protection Officer must first have a clear understanding of the operational planning process (OPP). The OPP is a logical military problem solving process, which draws together all factors to enable the development of course of action (CoA), and the subsequent development of the operation plan (OPLAN). The OPP is central to the formulation of the OPLAN and accompanying directives, such as environmental protection directives. The components of the NATO Operational Planning Process are found in Figure 15 below.

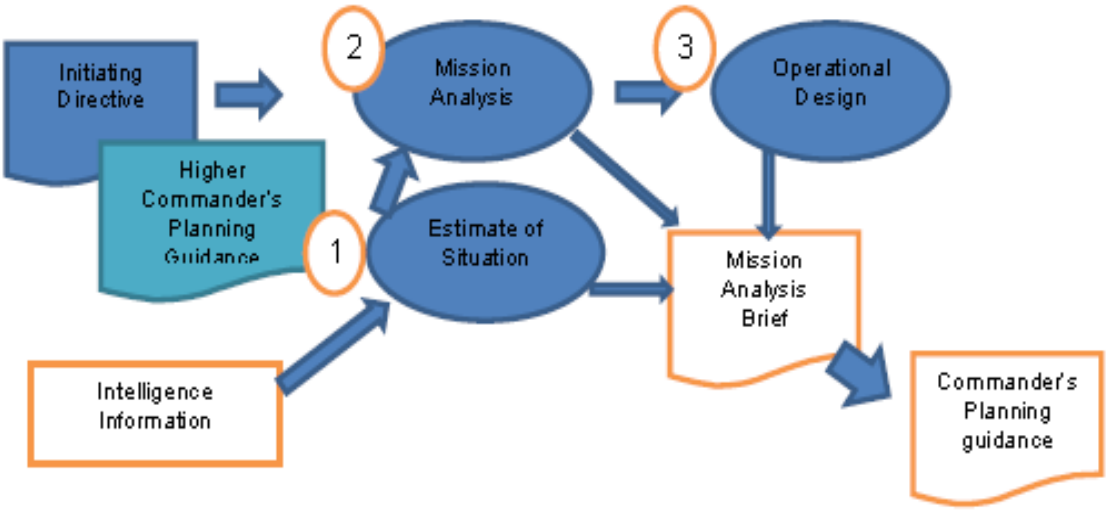


Figure 15 - Typical NATO member military Operational Planning Process
(source: NATO STANAG 7141)

The duties of the Environmental Protection Officer at each stage of the process will vary, but clearly the main effort will be in Steps 1 to 3. Table 8 provides the responsibilities of the Environmental Protection Officer.

Table 8 - Additional Likely Environmental Protection Officer Responsibilities

	NATO Operational Planning Process					
	Appointment	**Receipt**	**Planning Estimate**	**Preliminary Orders**	**Subsequent Activity**	**Execution**
Likely EP Officer Responsibilities	EP Officer	Member of planning team. Develops Battlefield Area Evaluation (BAE) overlay in conjunction with other Subject Matter Experts (SMEs).	Provides Planners with advice on EP issues. Member of Combat Service Support (CSS) planning team and act as EP officer. Support to Int/Ops in the continued development of the IPB.	Production of EP Annex to OPLAN. Production of BAE overlays.	Preparation of EP products in support of OPLAN. Communication plan to Bde/unit EP Focal Points.	Establish/Review and Monitor EMS in operational area.

Development of an Environmental Management Plan (EMP)

It is important to establish and communicate the roles, responsibilities, and standards for effective environmental management, and to maintain records of site assessments, decisions made in the field, environmental incidents, and specific actions taken. The creation and periodic updating of

written EMP is needed. The EMP must be approved by the Commander. There are numerous reasons for establishing and maintaining a written EMP throughout the course of a deployment, as next:

- Facilitate participation and support from higher level leadership.
- Incorporates the general principles of an EMS. (Figure 16)
- Defines, standardizes, promulgates, and communicates environmental standards and SOPs.
- Serves as a guidebook for inexperienced personnel.
- Provides a venue for the transfer of records and documents among forces.
- Helps resolve or prevent future legal actions.
- Provides historic documentation.

Figure 17 illustrates the generic process for establishing, executing and reviewing appropriate actions for any type of environmental consideration. Thus, for each consideration the first step is to identify its features, the types of supplies and equipment that will be needed and options available for treatment and disposal, and possible sources / suppliers. These will determine the source characterization. The EMB then determines the appropriate standards and identifies what resources are available, resulting in a recommended course of action. As the action is executed, it is essential that good documentation be maintained and reviewed in order to help update the EMP. Compliance is monitored through the use of checklists, audits, and sampling. Through compliance monitoring, it is possible to identify whether the course of action fulfils all requirements or whether adjustments need to be made. Such feedback goes to the EMB, which can then recommend any necessary changes to the process. This simple process follows the general requirements for an EMS and is designed for continual improvement in environmental considerations.

Figure 16- Typical NATO member military Operational Planning Process
(source: NATO STANAG 7141)

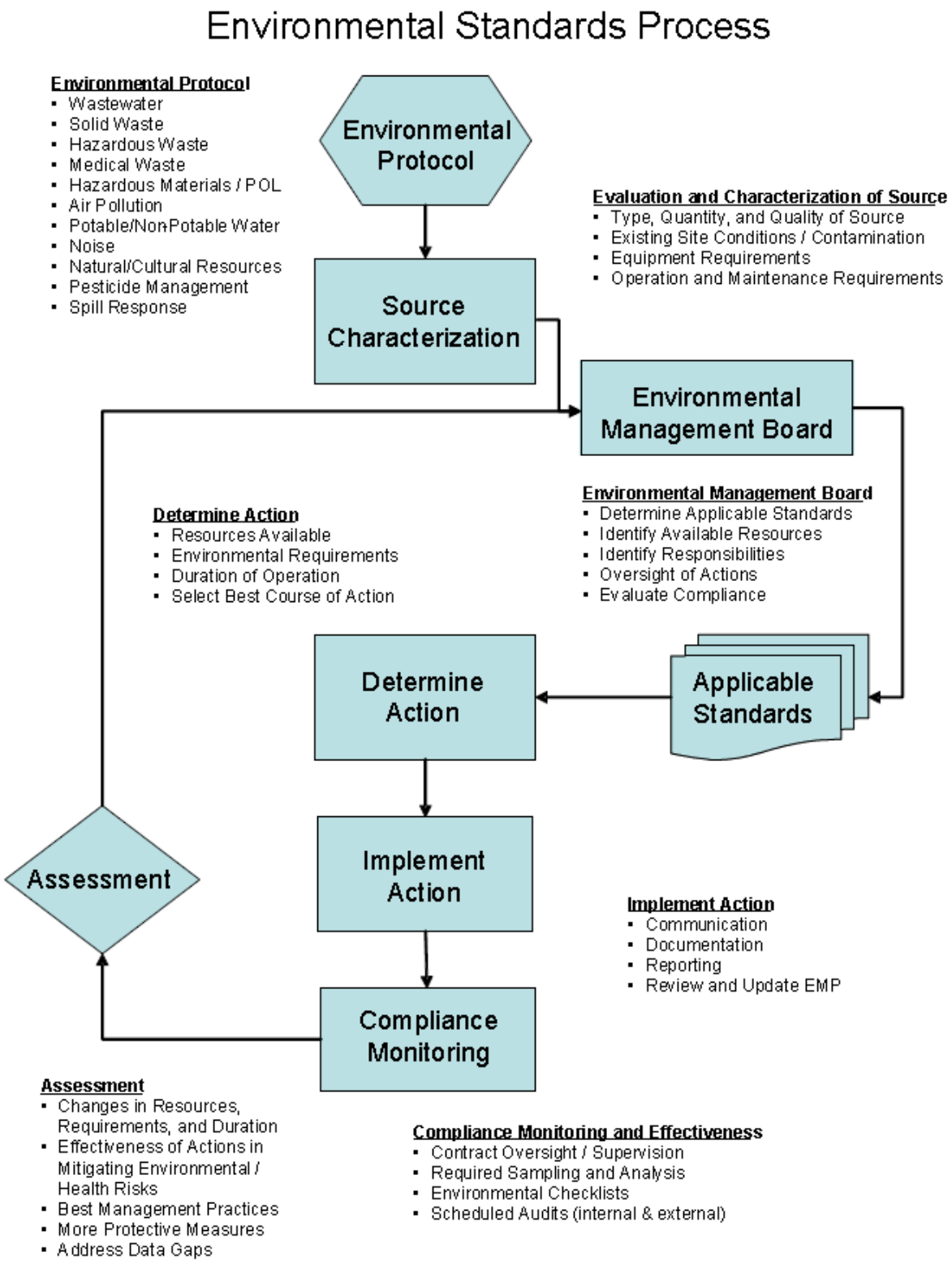


Figure 17 - Environmental Standards Process

(source: NATO STANAG 7141)

Elements of an Environmental Management Plan (EMP)

An effective EMP must be approved by the Commander and should include, at a minimum, the recommended elements, as described below[106]:

- Environmental Roles and Responsibilities
- Environmental Management Board
- Applicable Environmental Protocols, SOPs and BMPs
- Training Requirements and Training Deficiencies
- Reporting, Recordkeeping & Archiving
- EMP Evaluation and Updating Process

Key Elements of a NATO member Armed Forces EMS

The key features and proposed structure of the NATO Alliance EMS are described below in Figure 18. Significant considerations should be given to the roles, implications and consequences of contracting activities in regards to environmental management.

[106] Documents that spell out specific environmental responsibilities for different personnel include: Annex B to NATO STANAG 7141 (ed 4) Joint NATO Doctrine for Environmental Protection During NATO Led Military Activities; SOP HQ ISAF III, chapter 10, section 520 (SOP DI 10520 v0.1), paragraph 7.e.; and the US Air Force Handbook 10-222, Vol. 4, Environmental Guidelines for Contingency Operations Overseas (1 March 2007), Section 1.5

Figure 18 - Typical NATO member Armed Forces EMS Structure
(source: www.nato.int)

Information Gathering

The gathering of environmental data at the earliest stage is critical and will reduce the energy required to manage the other stages in the EMS process. This will ensure that environmental aspects and associated impacts are identified and addressed early in the planning process[107]. It is, therefore, essential that Environmental Protection Officers engage fully in the NATO OPP, and develops close working relationships with other SMEs such as Engineering and Logistic staffs.

[107] A preliminary list of potential environmental aspects and related impacts that could be found in military compounds is offered in STANAG 2583 Ed 1

Environmental Management Board (EMB)

It is recommended that an EMB will be formed to manage and coordinate the Environmental Protection plan. Suggested EMB membership as shown in Figure 19 and Table 2.

Figure 19 - Suggested EMB Membership

Table 9 - EMB Composition and Generic Terms of Reference

Chairman	J4/Jeng
Members/Reps from	Pers (Med)
	Intel
	Ops
	Plans
	Log/J Eng
	CIMIC
Special Members – As required	Finance
	Contracting
	Civil Affairs
	Legad
Generic Terms of Reference	
To: Identify environmental aspects.	
Identify environmental impacts.	
Identify control measures.	
Set performance standards.	
Set performance measurement.	
Set key environmental decision points for duration of operation	

Environmental Baseline Studies (EBS)

During the information gathering process, will be necessary to carry out an EBS. The EBS determines the extent of any environmental features that may be present and documentation is necessary. The report must be

produced and include at a minimum the purpose, scope, findings, and recommendations of the EBS[108].

Screening

Once enough information has been gathered, these can be screened by risk assessment to prioritize threats and target resources. Table 3 offers an example.

Table 10 - Risk Assessment Matrix Example

HAZARD SEVERITY	HAZARD PROBABILITY				
	Frequent (A)	*Likely (B)*	*Occasional (C)*	*Seldom (D)*	*Unlikely (E)*
Catastrophic (I)	Extremely high	Extremely high	High	High	Moderate
Critical (II)	Extremely high	High	High	Moderate	Low
Marginal (III)	High	Moderate	Moderate	Low	Low
Negligible (IV)	Moderate	Low	Low	Low	Low
	RISK ESTIMATE				

Commander's Intent

In accordance with STANAG 7141, the commander should provide clear guidance on environmental protection for the military activities as early as possible in the planning process. If this is included in the Commander's Intent, officers will realize that there is an over-arching document as an Annex of the OPLAN and details how the EMS is to be managed during the deployment. It also sets out the Commander's commitment to Environmental Protection and sustainable development from which the Environmental Protection Officer will derive his authority to enforce the EMS.

Organisation

Management of Environmental Protection on deployments entails a range of responsibilities distributed through the chain of command from Environmental Protection Officers in the Headquarters (HQ) to unit leaders and down to the individual soldier. This structure will be contained in the Commander's Intent.

[108] An example of a primary EBS can be found in the Best Environmental Protection Practices for Military Compounds in NATO Operations (AJEPP -2)

Control Measures

Many control measures can be integrated into the design of field accommodation, such as water treatment plants and field incinerators. This will require close liaison with the Field Infrastructure specialists. The Environmental Protection Officer should take account of the related Best Environmental Protection Practices for Military Compounds in NATO Operations [109] in developing control measures for an EMS including physical control, monitoring, record keeping, methods. The responsibility for control measures concerns the whole chain of command. Control measures for an EMS may include physical control, monitoring, record keeping, procedures.

Setting Objectives

The process of setting objectives and targets supported by relevant Performance Indicators (PIs) is a way of improving environmental performance and achieving continuous improvement. An objective is an overall goal, which may be made up of smaller targets. A target is a more detailed performance requirement that needs to be met in order to achieve the goal. For example, if a reduction of water consumption is the goal, the target is by "how much" over set time frames. Environmental objectives should follow the SMART process detailed below:

Specific: well defined and clear.

Measurable: to determine whether have been attained they must be measurable.

Agreed Upon: agreement with the stakeholders is vital.

Realistic Objectives: must be within the availability of resources, knowledge and capability of the forces.

Time Based: objectives and targets must be time framed appropriately. It is unrealistic to set strict timeframes for environmental objectives since the initial stages.

[109] NATO, (2001), *"The AJEPP-2 – Allied Joint Environmental Protection Publication - Best Environmental Protection Practices for Military Compounds in NATO Operations",* (STANAG 2582 - Standardization Agreement 2582)

Measuring Performance

Environmental performance evaluation is a process designed to provide with assurance that the environmental responsibilities are met efficiently and that the Environmental Appendix is being followed. The evaluation itself comprises a structured, documented, periodic and objective evaluation of the effectiveness of the EMS. It will provide the performance benchmarks that allow to identify areas of development and to ensure that environmental systems are working optimally.

There are a number of evaluation options:

- Strategic Environmental Protection evaluation carried out by national Environmental Protection experts,

- Tactical Environmental Protection evaluations carried out by the Force Environmental Protection Officer,

- Unit Environmental Protection evaluations which are self-assessment unit evaluations conducted by the unit Environmental Protection point, and

- Targeted Environmental Protection evaluations, which are assessments of performance of specific areas, measured against standards such as air pollution, water pollution, and waste disposal.

Review and Continuous Improvement

The EMS is dynamic so it will need reviewing and developing as conditions change. Much of this will be based on the results of the evaluations. Everyone is responsible for consistent application of the relevant protocol. The data obtained will be used in order to evaluate and review the performance and take the needed action accordingly[110].

[110] Bowling, C. M.., Lavonen, E. & Salestrand, J., (2008), *"Environmental Guidebook for Military Operational"*

Annex “B”

“Study Area: selected Pilot Study Camp[111] Project”

Overview

The selected camp’s project, is co-funded by the European Commission (DG Environment), and is titled "Military Energy and Carbon Management" (MECM) regarding the development and implementation of Energy Management System according to the international standard EN ISO 50001:2011 as well as the technical implementation of pilot projects - interventions in selected facilities into camp with a view to improving their energy / performance. To achieve these objectives, the Project, among others, include the development of energy policy in the ED, the interaction of the Project with respective co-financed programs and the training plan expansion project within the same camp, and other facilities in the ED.

Location

The selected camp is located on Thrace region, north of the Egnatia road. It is a large area, covering 16,700 acres and containing both terrestrial and mountain areas, excluding the firing area north of it. In the camp, different units have their infrastructure which can be categorized regarding their use purpose, in the next:

- Administration Buildings, Battalion Buildings, Restaurants
- Parking and maintenance shelters
- Firing Area

Activities

The area considered possessing high biodiversity and is located relatively away from major residential areas, is not affected by urban spreading and is controlled by strict access rules. Normally, the terrestrial area of the camp can only be accessed by “persons engaged in MoD activities”. The key elements of it are size and location, which allow for joint

[111] For disclosure reasons, names and locations will not be referred. They are available upon request.

service training for large formation exercises in a safe and cost efficient manner, where most weapon systems can be employed.

Area ownership and stakeholders

The area is under the control of MoD (Hellenic Army General Staff-HAGS). Camp's stakeholders can be generally divided into two types, key stakeholders and community. Key stakeholders consist of government agencies and State levels. These key stakeholders are highly interdependent with regard to the military activities and environmental management of the Camp. The Defence sector and HAGS make the decisions, with the State government agencies playing a minor advisory role by providing relevant input and suggestions. The community is broadly acknowledged as one kind of stakeholder; because "the organization is obliged to consider community as a stakeholder in its environmental management"[112] The wider community of SWBTA includes many groups, such as a local council, NGOs and residents in the areas surrounding.

The Project

The area of intervention chosen to join the project is the cantonment area and the environmental and energy management of the camp with activities that will contribute to the energy upgrade of buildings and environmental protection and restoration of the site.

The chosen buildings are constructed between 1982 and 1988. The general condition of the buildings found to be good, while there were no signs of damage to the supporting structure and the packing elements of buildings. In the camp, today are living about 1000 people with a perspective conversion of the camp that will serve approximately 3000 people. .

Briefly the interventions include:

- The energy efficiency upgrade of 7 buildings with total area 7.060m2.
- Pilot geothermal system in conjunction with underfloor heating in building area of 1000 m2 surface.

[112] Greenwood, 2001a, p. 8

- The construction of a new gate which will enhance and promote effectively the project to the local community.
- The utilization of open spaces (approximately 8.800m2 total), participating in the improvement of the microclimate in the camp and energy conservation of the buildings.
- The redesign of the drainage network of the camp and its connection to the main sewer system of the local City, containing biological purification system.
- The reduce of electrical consumption.
- Joining network with natural gas.
- The installation of photovoltaic.
- Waste Management system of materials which may cause environmental pollution, including the temporary storage of hazardous waste, the storage and recycling of waste materials (used vehicle tires, electrical and electronic equipment, batteries and dry cells vehicles, scrap), the management of waste oil, the separation of water waste and wash stations water (wash waters, oil - petroleum residues) and the storage of anti-ice liquids.
- Construction of Photovoltaic Power Station 100kWp, which will be connected to the low voltage grid, so as the Camp will cover part of the electricity needs of the camp. The camp will be concerned as “self-producer” according to the PPC and will not provide the produced energy for commercial exploitation.
- Construction of Model Photovoltaic System using a unique film on the roof of a building to inform and raise awareness on the use of renewable sources.
- Installation of BEMS System, in order to control the electrical facilities, the energy consumption of the camp, the registration and control of water consumption and the registration and control of gas consumption as well as to monitor the energy produced from the renewable sources within the Camp.

- The construction of gas networks within the Camp for cooking and heating boiler and hot water usage.

Methodology

For the preparation of the project, the initial conditions were identified prior to site visits while receiving relevant data and contact with agencies involved in managing operations. Energy audits of the buildings were issued, and Energy Performance inspections were held to categorize the energy class of each building and its energy consumption for the baseline data. Moreover, alternative scenarios have been developed to improve energy buildings efficiency.

The needed interventions were divided in three Priority Axes:

Priority Axis 1: "Protecting the Environment & Urban Transportation - Managing Climate Change - Renewable Energy".

Priority Axis 2: «Protection and Management of Water Resources".

Priority Axis 3: "Territorial Protection Systems & Management of Solid Waste".

Budget

The total projected Budget of the Project for the 3 axes' actions can be seen in Appendix B-1.

Cost Benefit Analysis

The Simple Payback period of the Project is presented in Appendix B-2.

Appendix "B-1"

Table 11 - Total Projected Budget[113]

Total Budget of Priority Axes				
	Project	Cost (EURO)	Vat 23% (EURO)	Total Cost (EURO)
Priority Axis 1				
Protecting the Environment & Urban Transportation - Managing Climate Change - Renewable Energy Renewable Sources of Energy				
ΚΩΔ. 40	**Renewable Source of Energy - Solar**			**237.636,00 €**
ΚΩΔ. 4001		193.200,00 €	44.436,00 €	
ΚΩΔ. 42	**Renewable Sources of Energy - Geothermal, Hydroelectric etc.**			**1.005.430,11 €**
ΚΩΔ. 4202		557.757,57 €	128.284,24 €	
ΚΩΔ. 4204		259.665,28 €	59.723,01 €	
ΚΩΔ. 43	**Energy Efficiency, Production, Management**			**2.516.576,28 €**
ΚΩΔ. 4301		1.603.940,88 €	368.906,40 €	
ΚΩΔ. 4302		0,00 €	0,00 €	
ΚΩΔ. 4305		442.056,10 €	101.672,90 €	
ΚΩΔ. 47	**Air Quality**			**560.880,00 €**
ΚΩΔ. 3501		456.000,00 €	104.880,00 €	
ΚΩΔ. 8601	**Assessments (DESIGN, TECHNICAL CONSULTING, EVALUATIONS)**	477.220,09 €	109.760,62 €	**586.980,71 €**
ΚΩΔ. 8611	**Community information and Project promotion**	58.256,00 €	13.398,88 €	**71.654,88 €**
Budget of Priority Axis 1				**4.979.157,98 €**
Priority Axis 2				
Protection and Management of Water Resources				
ΚΩΔ. 45	**Water Management (Drinking Water)**			**297.272,84 €**
ΚΩΔ. 4503		241.685,24 €	55.587,60 €	
ΚΩΔ. 4514		0,00 €	0,00 €	
ΚΩΔ. 46	**WATER TREATMENT**			**446.490,00 €**
ΚΩΔ. 4603		363.000,00 €	83.490,00 €	
ΚΩΔ. 8601	**Assessments (DESIGN, TECHNICAL CONSULTING, EVALUATIONS)**	27.672,99 €	6.364,79 €	**34.037,78 €**
ΚΩΔ. 8611	**Community information and Project promotion**	13.000,00 €	2.990,00 €	**15.990,00 €**
Budget of Priority Axis 2				**793.790,62 €**
Priority Axis 3				
Territorial Protection Systems & Management of Solid Waste				
ΚΩΔ. 44	**Management of Household and Industrial waste**			**2.891.424,72 €**
ΚΩΔ. 4403		0,00 €	0,00 €	
ΚΩΔ. 4409		2.350.751,80 €	540.672,91 €	
ΚΩΔ. 8601	**Assessments (DESIGN, TECHNICAL CONSULTING, EVALUATIONS)**	307.868,33 €	70.809,72 €	**378.678,05 €**
Budget of Priority Axis 3				**3.270.102,77 €**
Budget of Priority Axis 1, 2 & 3				**9.043.051,37 €**

[113] The detailed Actions for each Axis are available upon request. They are omitted due to disclosure reasons.

Appendix "B-2"

Simple Payback period[114]

Analysis of Reduction of Annual Energy Cost

The calculation of the annual energy cost savings results from the energy saved unit multiplied to the final cost of this unit.

That is:

- Heating Energy (diesel) : 228,65 – 42,0= 186,65 kWh_{th} / m^2,year X 0,14 € / kWh_{th}= **26,13€ / m^2,year**

  (Diesel price used for 2012-2013:1,40 € / lit,

  H_o=9,95 kWh / lit, Thermal Energy price: 0,14€ / kWh_{th})

- Electrical Energy: 118,82 – 67,37 = 51,45kWh_e / m^2,year X 0,10 € / kWh_e= **5,14€ / m^2,year**

Total: 26,13€ / m^2,year + **5,14€ / m^2,year = 31,27€ / m^2,year**

Therefore, for the total building area will be:

31,27€/m^2,year X 7.017,51 m^2 ≅ 220.402 € / year

The Heating and electrical needs for each chosen building before and after the project are presented in Table 12. The total cost for the chosen buildings is **1.610.000€** while the Photovoltaic installation cost is **234.500€**.

In the aforementioned benefit we should add and the benefit from the self-production due to Photovoltaic 100 kW installation, which is

139.944 kWh / year X 0,10 € / kWh ≅ 13.994 € / year.

Concluding, the Simple Payback period is the following:

$$\frac{1.844.500\,€}{234.396\,€/\text{έτος}} \cong \textbf{7,87 years}$$

[114] The detailed Actions for each Axis are available upon request. They are omitted due to disclosure reasons.

Table 12 - The Heating and electrical needs for each chosen building before and after the project[115]

ΚΤΙΡΙΟ	ΕΜΒΑΔΟΝ (m2)	ΘΕΡΜΙΚΗ ΕΝΕΡΓΕΙΑ ΥΦΙΣΤΑΜΕΝΟΥ ΚΤΙΡΙΟΥ (kWh_{th}/m2)	ΘΕΡΜΙΚΗ ΕΝΕΡΓΕΙΑ ΥΦΙΣΤΑΜΕΝΟΥ ΚΤΙΡΙΟΥ (kWh_{th})	ΗΛΕΚΤΡΙΚΗ ΕΝΕΡΓΕΙΑ ΥΦΙΣΤΑΜΕΝΟΥ ΚΤΙΡΙΟΥ (kWh_e/m2)	ΗΛΕΚΤΡΙΚΗ ΕΝΕΡΓΕΙΑ ΥΦΙΣΤΑΜΕΝΟΥ ΚΤΙΡΙΟΥ (kWh_e)	ΘΕΡΜΙΚΗ ΕΝΕΡΓΕΙΑ ΚΤΙΡΙΟΥ ΠΑΡΕΜΒΑΣΕΩΝ (kWh_{th}/m2)	ΘΕΡΜΙΚΗ ΕΝΕΡΓΕΙΑ ΚΤΙΡΙΟΥ ΠΑΡΕΜΒΑΣΕΩΝ (kWh_{th})	ΗΛΕΚΤΡΙΚΗ ΕΝΕΡΓΕΙΑ ΚΤΙΡΙΟΥ ΠΑΡΕΜΒΑΣΕΩΝ (kWh_e/m2)	ΗΛΕΚΤΡΙΚΗ ΕΝΕΡΓΕΙΑ ΚΤΙΡΙΟΥ ΠΑΡΕΜΒΑΣΕΩΝ (kWh_e)	ΕΞΟΙΚΟΝΟΜΗΣΗ ΘΕΡΜΙΚΗΣ ΕΝΕΡΓΕΙΑΣ (kWhth/m2)	ΕΞΟΙΚΟΝΟΜΗΣΗ ΕΝΕΡΓΕΙΑΚΟΥ ΚΟΣΤΟΥΣ ΘΕΡΜΙΚΗΣ ΕΝΕΡΓΕΙΑΣ(€/m2)	ΕΞΟΙΚΟΝΟΜΗΣΗ ΗΛΕΚΤΡΙΚΗΣ ΕΝΕΡΓΕΙΑΣ (kWhe/m2)	ΕΞΟΙΚΟΝΟΜΗΣΗ ΕΝΕΡΓΕΙΑΚΟΥ ΚΟΣΤΟΥΣ ΗΛΕΚΤΡΙΚΗΣ ΕΝΕΡΓΕΙΑΣ (€/m2)	ΣΥΝΟΛΙΚΟ ΚΕΡΔΟΣ(€)
	1.028,94	236,00	242.829,84	112,20	115.447,07	56,00	57.620,64	64,00	65.852,16	180,00	25,33	48,20	4,82	31.019,08
	1.024,03	198,90	203.679,57	154,80	158.519,84	23,60	24.167,11	89,90	92.060,30	175,30	24,67	64,90	6,49	31.903,99
	811,80	318,00	258.152,40	123,10	99.932,58	47,60	38.641,68	68,70	55.770,66	270,40	38,05	54,40	5,44	35.302,12
	623,00	234,10	145.844,30	147,20	91.705,60	37,70	23.487,10	71,90	44.793,70	196,40	27,63	75,30	7,53	21.907,28
	780,66	339,80	265.268,27	51,00	39.813,66	138,60	108.199,48	40,00	31.226,40	201,20	28,31	11,00	1,10	22.958,86
	1.028,97	207,10	213.099,69	156,50	161.033,81	22,30	22.946,03	91,60	94.253,65	184,80	26,00	64,90	6,49	33.433,30
	845,11	182,80	154.486,11	120,10	101.497,71	23,30	19.691,06	62,40	52.734,86	159,50	22,44	57,70	5,77	23.842,42
	875,00	138,50	121.187,50	75,30	65.887,50	0,00	0,00	41,20	36.050,00	138,50	19,49	34,10	3,41	20.035,26
Total annual energy savings	7.017,51		1.604.547,67		833.837,77		294.753,10		472.741,73					**220.402,31**

[115] The detailed names are available upon request. They are omitted due to disclosure reasons.

Annex “C”

Questionnaires and Cover Letters Samples

Appendix “C-1”

Defence sector key authorities Questionnaire

School of Economics and Business Administration

MSc in Sustainable Development Programme

COVER LETTER

Dear Sir/Madam,

My name is Lazaros Rizopoulos and I am a postgraduate student from the International Hellenic University (IHU). I am currently undertaking a Master of Science (MSc) Programme in Sustainable Development Strategies and as part of my programme I am writing my dissertation which involves the study and review of Environmental Management Systems in the international Military / Defence sector.

The aim of my dissertation is to review the costs and benefits of the implementation as also as to establish potential guidance for Armed Forces in general, encouraging them to implement certified environmental management systems.

I would be grateful if you could find the time to complete the attached questionnaire, which should take no more than 5 to 10 minutes. Your thoughts and ideas on the issues are very important and would provide great value for my dissertation. Each organization or firm will be treated anonymously and the data will be used only for my research, and if you agree to participate all the information you provide will be completely anonymous and confidential.

If you feel you are not the relevant person to answer this questionnaire, I would be very thankful if you could forward it to the right person. It would be very helpful to me if you can possibly finish it and return to rizola1@gmail.com or l.rizopoulos@ihu.edu.gr as soon as you can.

If you would like to have a short summary of my dissertation including the questionnaire findings, I will be happy to send them to you when the research is completed.

Should you have any queries or concerns about the survey, please do not hesitate to contact me on the email address above.

Many thanks in advance for your time and consideration.

Yours Faithfully,

Lazaros Rizopoulos

INTERNATIONAL HELLENIC UNIVERSITY

School of Economics and Business Administration
MSc in Sustainable Development Programme

Questionnaire concerning the details of EMS (ISO 14001, EMAS or Other) implementation practice and experiences in the Military / Defence sector.

It should take no more than 10 minutes to complete. If your organization is not certified to an EMS, it should take no more than 5 minutes to complete.

For Each question please answer with a tick (√) or **X** in the relevant response boxes.

Part 1. General Environmental Concerns

1.1 Please look at the following list of environmental issues, and circle the three issues that concern you the most. Please only circle three issues from the list:

Air pollution	□
Pollution of rivers and seas	□
Flooding	□
Litter	□
Poor waste management (e.g. overuse of landfills)	□
Climate change	□
The hole in the ozone layer	□
Using up the earth's resources	□

1.2 In your personal view, has air pollution ever affected your health?

Yes	□
No	□
Don't Know	□

1.3 Apart from effects on people's health, are you aware of any other effects of air pollution?

Yes	□
No	□
Don't Know	□

1.4 If yes, what other effects are you aware of? _____

1.5 Have you heard of “climate change”?

Yes □
No □
Don’t Know □

1.6 Where have you heard about climate change? _____

1.7 How important is the issue of climate change to you personally?

Very □
Little □
Not at all □

Part 2. General Organization Information

2.1 Please indicate which of the following best describes your business.

International Organization □
Public Upper level Organization □
Public Mid / Low Level Organization □
Other _____

2.2 What is the size of your department / business?

Micro (1 – 9 employees) □
Small (10 – 49 employees) □
Medium (50 – 249 employees) □
Large (More than 250 employees) □

2.3 Please indicate the following impacts that you think your actions have on the environment. (You can choose more than one answer)

Noise and vibration impacts □
Air quality impacts □
Visual impacts □
Water quality impacts □
Construction waste impacts □
High energy consumption □
Social impacts □
Other_____

2.4 Is your business certified to an EMS?

Yes (Please go to Part 3)

Please specify what date your company was certified _____

Please specify what kind of EMS your company was certified for_____

No (Please go to Part 4)

Part 3. Organizations certified to an EMS

3.1. What are the environmental aspects that your department / business focused on in implementing an EMS and now? (You can choose more than one answer)

Implementation Stage	Please tick	**NOW**	Please tick
Energy usage		Energy usage	
Air pollution control		Air pollution control	
Material recycling		Material recycling	
Noise control		Noise control	
Waste disposal control		Waste disposal control	
Water pollution control		Water pollution control	
Others	Please specify	Others	Please specify

3.2. Please provide the percentage of environmental objectives that have been met since certification.

Below 50% □

50% - 80% □

Above 80% □

3.3. What kind of methodology or procedure does your organization use to assess the significance of the aspects and impacts? (You can choose more than one answer)

Ranking/Scoring □

Please specify significance factors/criteria used _____

Risk matrix/Risk analysis □

Group brainstorming □

Manager's judgement □

Hazard survey □

Other_____

3.4. How much do you think your organization has spent on EMS implementation and certification?

Below €30,000 □

€30,000 - €50,000 □

€50,000 - €80,000 □

€80,000 - €100,000 □

Above €100,000 □

3.5. a. Do you require from your sub-contractors and suppliers to be an EMS certified?

Yes □, Please go to 3.6.

No □, Please go to 3.5b.

3.5. b. If not, what requirements do you make of your sub-contractors and suppliers?

They must have Environmental policy □

They must be legally compliant □

They must have internal environmental management systems □

None □

3.6. Do you provide help to your sub-contractors and suppliers to implement Environmental Management Systems?

Yes □

Please provide some examples _____

_____

No □

3.7. How significant would you rate the following factors in motivating your organization to implement an EMS? (1: Most significant; 8: Least significant)

Government pressure	1	2	3	4	5	6	7	8
Society pressure	1	2	3	4	5	6	7	8
Management requirement	1	2	3	4	5	6	7	8
Awareness of environmental impacts	1	2	3	4	5	6	7	8
Consensus on standard EMS needed	1	2	3	4	5	6	7	8
Environmental culture	1	2	3	4	5	6	7	8
Efficient documentation process	1	2	3	4	5	6	7	8
Internal cost reduction	1	2	3	4	5	6	7	8

Legal compliance	1 2 3 4 5 6 7 8
Develop image (“fame and shame” issues)	1 2 3 4 5 6 7 8

3.8. What difficulties / barriers did your organization encounter during the implementation / certification process?

Lack of government guidance / support □
Difficulties in managing the supply chain □
Lack of support from suppliers / sub-contractors □
Lack of employee support □
Others (Please specify)_____

3.9. Did employees participate or input into the development of your environmental policy?

Yes □
Please specify on which stage: Implementation □
Certification □
Implementation & certification □
No □

3.10. If it is possible, please attach a copy of yours environmental policy when you return the questionnaire. Thank you.

Thank you very much for your time. Your responses are much more than appreciated.

Please kindly return the completed questionnaire to Lazaros Rizopoulos at rizola1@gmail.com or l.rizopoulos@ihu.edu.gr

Part 4. Organizations NOT certified to an EMS

4.1. Does your company have any Environmental Management System (EMS) or programme which is not certified to ISO 14001 or other to manage your environmental matters?

Yes □ Please specify the system _____
No □

4.2. How significant would you rate the following barriers in implementing a certified EMS (ISO 14001 or EMAS) ? (1: Most significant; 8: Least significant)

Lack of guidance	1 2 3 4 5 6 7 8
Implementation costs are too high	1 2 3 4 5 6 7 8
Difficulties in managing the supply chain	1 2 3 4 5 6 7 8
Lack of tailor-made training	1 2 3 4 5 6 7 8
Costs of improvement are too high	1 2 3 4 5 6 7 8

Lack of support from suppliers	1 2 3 4 5 6 7 8
Complex documentation processes / procedures	1 2 3 4 5 6 7 8
Lack of consensus on EMS standards	1 2 3 4 5 6 7 8
Lack of support from senior management team	1 2 3 4 5 6 7 8
Lack of support from other staff and workers	1 2 3 4 5 6 7 8

4.3. Please use this space to outline any other barriers / constraints you found which aren't listed above.

_____
_____
_____
_____

Thank you very much for your time. Your responses are much more than appreciated.

Please kindly return the completed questionnaire to Lazaros Rizopoulos at rizola1@gmail.com or l.rizopoulos@ihu.edu.gr

Appendix “C-2”

Environmental awareness Questionnaire

School of Economics and Business Administration

MSc in Sustainable Development Programme

COVER LETTER

Dear Sir/Madam,

My name is Lazaros Rizopoulos and I am a postgraduate student from the International Hellenic University (IHU). I am currently undertaking a Master of Science (MSc) Programme in Sustainable Development Strategies and as part of my programme I am writing my dissertation which involves the study and review of Environmental Management Systems in the international Military / Defence sector.

The aim of my dissertation is to review the costs and benefits of the implementation as also as to establish guidance for the Greek Armed Forces, encouraging them to implement certified environmental management systems.

I would be grateful if you could find the time to complete the attached questionnaire, which should take no more than 5 to 10 minutes. Your thoughts and ideas on the issues are very important and would provide great value for my dissertation.

The questionnaire starts by asking you about a range of environmental issues that may affect you and moves on to ask you how you feel about global environmental problems. If you don't want to answer all of the questions, you don't have to - please just do what you can. It shouldn’t take long to complete, and I hope you’ll enjoy it. If you agree to participate all the information you provide will be completely anonymous and confidential.

Should you have any queries or concerns about the survey, please do not hesitate to contact me on the email address (rizola1@gmail.com or l.rizopoulos@ihu.edu.gr).

Many thanks in advance for your time and consideration.

Yours Faithfully,

Lazaros Rizopoulos

INTERNATIONAL HELLENIC UNIVERSITY

School of Economics and Business Administration
MSc in Sustainable Development Programme

Questionnaire concerning the environmental awareness and concerns in the Military / Defence personnel.

It should take no more than 10 minutes to complete.

For Each question please answer with a tick (√) or **X** in the relevant response boxes.

WHY SHOULD I RESPOND TO THIS SURVEY?

Take the following survey to see if your current efforts at compliance and sustainability could be helped by this survey and the relevant study.

Part 1: Could a management system help our unit / campus?

Compliance

1. Do you know what **legal environmental requirements** apply to your operations?

   (a) Yes and there is a system to keep us up to date on them

   (b) No, but I know who does

   (c) No

2. Are your operations in **compliance?**

   (a) Yes

   (b) More than 50% are

   (c) Less than 50% are

3. When do you usually become **aware** of the status of your unit / campus compliance?

   a) On a regular basis

   b) When we get inspected

   c) When we get a penalty or fine

Water

4. Do you know your annual **water** use and costs as well as potential ways to reduce them?

(a) Yes

(b) No, but I know who does

(c) No

Energy

5. Do you know your annual **energy** use and costs as well as potential ways to reduce them?

(a) Yes

(b) No, but I know who does

(c) No

Waste

6. Do you know how much **solid** and **hazardous waste** is generated and potential ways to reduce volume, toxicity and associated disposal costs?

(a) Yes

(b) No, but I know who does

(c) No

Public Image

7. What do you think the **general public** thinks of your unit / campus commitment to the environment and sustainability?

(a) Very responsible & committed

(b) Neutral

(c) Irresponsible and not committed

8. Do you know if your unit / campus has taken steps to reduce its **use of toxics** or implement other **pollution prevention** projects?

(a) Yes

(b) No, but I know who does

(c) No

Sustainability

9. Do you have sustainability projects or initiatives?

(a) Yes, they are documented and integrated into operations

(b) Yes, but if their project 'champions' leave, the efforts may not continue or expand

(c) No

Reactive vs. Proactive

10. How often do you feel you are reacting to crises rather than being proactive?

(a) Never

(b) Sometimes

(c) All the time

Now add up your score and check the results below:

of (a) answers_____ x 3 = _____

of (b) answers_____ x 2 = _____

of (c) answers_____ x 1 = _____

Total Score: ____

Questionnaire Results:

Score of 19-30: You have systems and procedures in place that enable you to be in compliance, identify opportunities to reduce or avoid costs, and promote sustainability. This study may provide new ideas to keep your programs on track.

Score of 10-18: You have some systems and procedures in place but improvements could be made. This study will help you improve your programs and achieve your goals.

A score of <10: An Environmental Management System is needed! This study will provide the road map to the system you need.

Part 2: How sustainable is our sustainability initiative?

1. Count up the environmental / sustainability projects or initiatives (e.g., recycling, energy conservation, waste reduction, green actions) you have going on at your unit / campus.

For each one, give yourself 3 points.

2. Do you have identified people or positions that are responsible for the projects or initiatives?

If yes, add 2 points.

If no, take away 2 points.

3. Are there specific goals set for these projects / initiatives? (e.g., reduce waste generation by X % by Y date)

If yes, add 2 points.

If no, take away 2 points.

4. Are there measures (e.g., normalized, meaningful) and established baseline conditions?

If yes, add 2 points.

If no, take away 2 points.

5. Are there written procedures and systems in place that document how these projects / initiatives actually operate?

If yes, add 2 points.

If no, take away 2 points.

6. Are these projects / initiatives evaluated on a regular basis?

If yes, add 2 points.

If no, take away 2 points.

7. Does your administration get briefed on progress, challenges and needs?

If yes, add 2 points.

If no, take away 2 points.

Assessment: If you found yourself starting with a lot of points because your unit / campus has a lot of environmental or sustainability projects but then found you subtracted points because of a lack of identified responsibilities, goals, measures, and procedures, you don't have a system in place to keep the Sustainability Initiative going.

Individual projects and initiatives are great but they are most effective when they are connected with operations, have documented procedures, use measures and are checked to see how they are working.

Part 3. General Environmental Concerns

3.1 Please look at the following list of environmental issues, and circle the three issues that concern you the most. Please only circle three issues from the list:

Air pollution	□
Pollution of rivers and seas	□
Flooding	□
Litter	□
Poor waste management (e.g. overuse of landfills)	□
Climate change	□
The hole in the ozone layer	□
Using up the earth's resources	□

3.2 In your personal view, has air pollution ever affected your health?

Yes	□
No	□
Don't Know	□

3.3 Apart from effects on people's health, are you aware of any other effects of air pollution?

Yes	□
No	□
Don't Know	□

3.4 If yes, what other effects are you aware of? _____

3.5 Have you heard of "climate change"?

Yes	□
No	□
Don't Know	□

3.6 Where have you heard about climate change? _____

3.7 How important is the issue of climate change to you personally?

Very	□
Little	□
Not at all	□

Part 4. General views about the environment

4.1 Now please indicate how much you agree or disagree with the following general statements by ticking one box on each row: (1: Totally Agree; 5: Totally Disagree)

a.	Jobs today are more important than protecting the environment for the future	1	2	3	4	5
b.	I am unwilling to make personal sacrifices for the sake of the environment	1	2	3	4	5
c.	If my job caused environmental problems, I'd rather be unemployed than carry on causing them	1	2	3	4	5
d.	Having a car is part of having a good lifestyle	1	2	3	4	5
e.	Humans have the right to modify the natural environment to suit their needs	1	2	3	4	5
f.	Humans are severely abusing the planet	1	2	3	4	5
g.	Nature is strong enough to cope with the impact of modern industrial nations	1	2	3	4	5
h.	The balance of nature is very delicate and easily upset	1	2	3	4	5

4.2 The following is a list of activities that you may do. (You can choose more than one answer)

Walk or cycle to work □
Use public transport □
Turn off lights I'm not using □
Buy energy efficient light bulbs □
Buy organic food □
Recycle glass □
Recycle other items □
Take part in a campaign about an environmental issue □

Other_____

4.3 What are the environmental impacts of your department / business? (you can choose more than one answer)

Implementation Stage	Please tick
Energy usage	
Air pollution control	
Material recycling	
Noise control	

Waste disposal control	
Water pollution control	
Others	Please specify

Part 5. About you

5.1. Are you:

Male □
Female □
Prefer not to say □

5.2. Please indicate the age bracket you are in:

18-24 □
25-34 □
35-44 □
45-54 □
Over 55 □

5.3. What is your educational background?

High School □
Bachelor Degree □
Postgraduate □
Other □

5.4. Are you a member of any environmental organization?

Yes □
No □

5.5. Please indicate your approximate family income per year.

<15.000€ □
15.000 – 20.000€ □
20.000 – 25.000€ □
25.000 – 30.000€ □

30.000 – 40.000€ □

>40.000€ □

5.6. Would you be willing to take part in a brief interview (either in person or over the phone) to discuss these issues further? As with this questionnaire, interviews will be strictly confidential?

Yes □

No □

Thank you very much for your time. Your responses are much more than appreciated.

Appendix "C-3"

Follow-up Telephone / Personal Interview

Questionnaire: No

Date:

1. What have been the benefits of certification to ISO14001 ?

2. How did your organization identify environmental impacts and aspects ?

3. What objectives and targets your organization has set over time? Please provide some examples. (Q 2.3)

If there were differences in Q 3.1, then 4, if not then go 5.

4. Why are there differences between the aspects your organization focused from the beginning and now? (Q 3.1)

   Does that indicate new impacts were identified?

   How do you identify them?

5. What specific methodology has your organization applied to assess the significance of all aspects, who was involved in the process? Consultancy? (Q 3.3)

   What sort of performance indicators does your organization use?

6. Did your organization monitor the money spent on EMS implementation and certification?

   Any cost savings through implementing targets e.g. waste reduction? Were the savings significant? (Q 3.4)

7. *If they require their supplier to be ISO certified*,

   Do you think that requiring your suppliers to be certified to an EMS makes managing your supply chain easier? (Q 3.5)

   If they don't require their supplier to be EMS certified,

   What difficulties / barriers have you encountered when managing your supply chain?

   If they tick 'suppliers must be legally compliant / they must have environmental policy',

   How do you confirm that your suppliers are legally compliant?

8. *If they don't provide help to the suppliers to implement an EMS, (Q 3.6)*

   Why not? Because of the costs?

9. Do you think the main purpose of getting certification is to enhance the company image and fulfill client requirement? (Q3.7)

10. *If there is employees participation, (Q3.8 and 3.9)*

In what way does your organization involve its employees? Do you think it is important to involve employees?

If there were no employees' participation, and barrier encountered was "lack of employee support",

Was employee participation considered? If not, why? What barriers have you encountered when engaging employees to participate in the EMS?

If they tick the box "lack of government guidance",

What barriers have you encountered when you seek for government support? What supports are you aware of? Any on-line guidance do you use?

11. To what extent do you think EMS certification can improve environmental performance in the military sector?

12. Do you think it is a trend to obtain an EMS certification?

Thank you very much for your time. Your responses are much appreciated.

Appendix “C-4”

Letters to authorities sample (Greek and English version)

School of Economics and Business Administration

MSc in Sustainable Development Programme

Αγαπητέ Κε_____,

Είμαι ο Λγός (ΑΣ) Λάζαρος Ριζόπουλος - υπηρετώ στο 1^{ο} ΤΕΕΠ - και είμαι μεταπτυχιακός φοιτητής στο Διεθνές Πανεπιστήμιο Ελλάδας (International Hellenic University – IHU). Το μεταπτυχιακό πρόγραμμα στο οποίο φοιτώ έχει τίτλο «Στρατηγικές Βιώσιμης Ανάπτυξης – Sustainable Development Strategies». Αυτή την περίοδο ετοιμάζω τη διπλωματική μου εργασία, η οποία έχει ως αντικείμενο μελέτης την αξιολόγηση των Συστημάτων Περιβαλλοντικής Διαχείρισης – Environmental Management Systems (EMS) στο διεθνή αμυντικό τομέα και την εξέταση τις αντίστοιχες πολιτικές των Ενόπλων Δυνάμεων διαφόρων Χωρών- Μελών του ΝΑΤΟ. Συναφώς θα καταλήγει με την αποτύπωση της υπάρχουσας κατάστασης στις Ελληνικές ΕΔ και την υποβολή προτάσεων για την βελτίωση της κατάστασης και την υιοθέτηση αν αυτό είναι δυνατό ανάλογων βιώσιμων στρατηγικών .

Θα σας ήμουν ευγνώμων αν μπορούσατε να διαθέσετε το χρόνο σας και όποια στοιχεία θεωρείτε ότι είναι δυνατό να με βοηθήσουν, σε ότι αφορά στην ανάδειξη των όποιων μέχρι τώρα πρωτοβουλιών βιώσιμης ανάπτυξης μέχρι τώρα έχει αναλάβει το ΥΠΕΘΑ ή το ΓΕΣ στα θέματα και τους τομείς αρμοδιότητας του.

Συνημμένα σας επισυνάπτω τη προτεινόμενη κι εγκεκριμένη δομή της διπλωματικής μου και την περίληψη αυτής .

Σας ευχαριστώ εκ των προτέρων,

Με εκτίμηση,

Λάζαρος Ριζόπουλος

INTERNATIONAL HELLENIC UNIVERSITY

School of Economics and Business Administration

MSc in Sustainable Development Programme

Dear Sir/Madam,

My name is Lazaros Rizopoulos and I am a postgraduate student from the International Hellenic University (IHU). I am currently undertaking a Master of Science (MSc) Programme in Sustainable Development Strategies and as part of my programme I am writing my dissertation which involves the study and review of Environmental Management Systems in international military sector.

The aim of my dissertation is to establish potential guidance for Armed Forces in general, encouraging them to implement certified environmental management systems.

I would be grateful if you could find the time to complete the attached questionnaire, which should take no more than 5 to 10 minutes. Your thoughts and ideas on the issues are very important and would provide great value for my dissertation. Each organization or firm will be treated anonymously and the data will be used only for my research.

If you feel you are not the relevant person to answer this questionnaire, I would be very thankful if you could forward it to the right person. It would be very helpful to me if you can possibly finish it and return to rizola1@gmail.com or l.rizopoulos@ihu.edu.gr as soon as you can.

If you would like to have a short summary of my dissertation including the questionnaire findings, I am happy to send them to you when the research is completed in December.

Many thanks in advance for your time and consideration.

Yours Faithfully,

Lazaros Rizopoulos

Acknowledgements

- Dissertation Supervisor

Dr. Constantinos Euaggelinos, Assistant Professor, Aegean University, Social and Humanistic Environmental Sciences Sector

I would like to express my gratitude to my dissertation supervisor for his patient supervision and support for this study.

- IHU's Academic Officials

Dr. Eftichios Sartzetakis, Professor of Environmental Economics, Director of the MSc in Sustainable Development, International Hellenic University,

Dr. Georgios Banias, PhD in Mechanical Engineering, Academic Assistant of the MSc in Sustainable Development, International Hellenic University

Also I want to express a sincere thanks to Dr. Eftichios Sartzetakis and my program mentor Dr. George Bania, for their invaluable counsel and guidance throughout the year.

My thanks and gratitude to the above mentioned as also as to other individuals who have participated or contributed in other important ways.

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